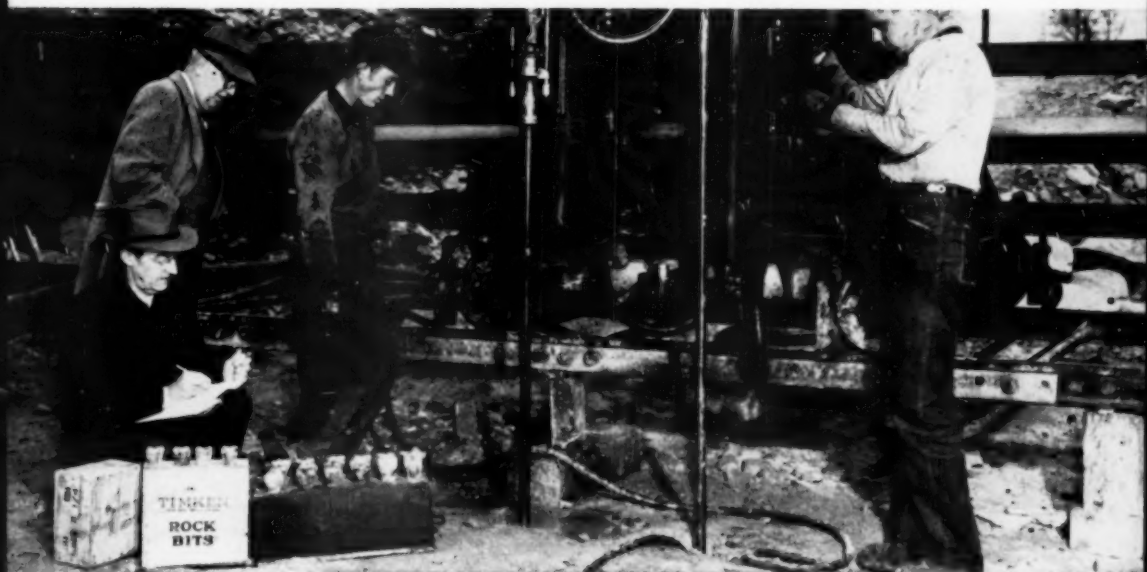


# ROADS AND STREETS

HIGHWAY CONSTRUCTION  
REPAIRS  
READY CONSTRUCTION

September 1962

Only the Timken Company offers all 3 rock bit types...



and a complete rock bit engineering service!

If you want to get the best bit for your particular job, go to the Timken Company—the only manufacturer who makes *all three* types of rock bits:



**1 MULTI-USE.** Gives lowest cost per foot of hole when full increments of drill steel can be drilled and when control and reconditioning of bits are correct.



**2 CARBIDE INSERT.** For drilling extremely hard and abrasive ground, smaller holes, extra deep holes. Holes go down faster, bit reconditioning is minimized.



**3 ONE-USE "SPIRALLOCK".** To use where reconditioning is not feasible—where circuit control of bits is difficult or impossible. Gives lowest unit cost of the three. "Spirallock" union holds bit on dependably, permits easy removal.

Because the Timken Company makes all 3 rock bit types and can make unbiased recommendations to meet your drilling needs, it offers the only *complete* rock bit engineering service. Backed by 20 years' experience in solving rock bit problems, our rock bit engineers will give you the bit performance you're after, whether you're looking for lowest bit cost, lowest cost per foot drilled, greatest possible drilling speed, or any other desired advantage.

**FREE BOOKLET!** Packed with helpful information. Shows full line of bits. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

## TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

... your best bet for the  
best bit ... for every job

3

## TS 200 MOTOR SCRAPERS

move 24,000 cubic yards of dirt in  
35 hours on a turn-around haul for  
**BOYD CONSTRUCTION COMPANY**



"We've been building good roads for almost 50 years and we know what good equipment means to our success. Speed and trouble-free operation are two features we look for in our earthmoving rigs...that's why we have 3 LaPlant-Choate TS 200's on this job. Moving 24,000 yds. in 35 hours on a turn-around haul, and with a 9-12 yd. rig, is speedy production in any language."

Supt. **JOHN BOYD**

Boyd Construction Co., Columbia, Miss.



## NOW—LAPLANT-CHOATE TS 200's are improved!

SINCE John Boyd set this record with his three LaPlant-Choate TS 200 Motor Scrapers on the 500,000-cu. yd. relocation of Mississippi State Highway 7 around the Grenada Dam, capacities of the TS 200 have been raised from 9-yds. to 10-yds. struck, and from 12-yds. to 13-yds. heaped. Now you can also have your choice of power . . . a 176 HP Buda or a 165 HP Cummins diesel . . . to insure top working speeds at all times. Other production-boosting features include full hydraulic operation; positive,

double-acting hydraulic steering; easy loading characteristics typical of all LPC earthmovers; positive forced ejection plus high apron lift; large 4-wheel brakes which allow top-speed operation (over 21 mph) with absolute safety. In addition, you get the rugged, sturdy construction that means low maintenance.

Get all the facts about the speedy, agile, powerful TS 200 Motor Scraper . . . the rig that's a money-maker on any size job. See your LaPlant-Choate distributor today.

# LAPLANT

MANUFACTURING CO., INC.



# CHOATE

CEDAR RAPIDS, IOWA, U. S. A.



Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of truck-type tractors.



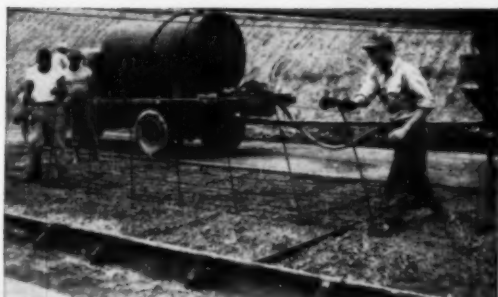
2- and 4-yd. Scrapers for truck-type and rubber-tired industrial tractors.



Hydraulic and Cable-operated Dozers.



Left to right: Don MacKay, project manager of S. J. Groves and Sons, Inc.; Walter Jonas, resident engineer for Pennsylvania Department of Highways; and E. Miller Smith, job superintendent, discuss the day's operations.



Bethlehem Hinged Bar Mats can be handled easily by only two men. With bottom section placed, hinged portion needs but slight push to fall into position.

Road-building caravan moves into one of the new highway's long curves. At right, Bethlehem Hinged Bar Mats lie along the finished strip, ready for placing.



## Express Highway Links Philadelphia and Turnpike

The four-lane Schuylkill Express Highway will provide a fast, direct route between Philadelphia and the Pennsylvania Turnpike's Eastern terminus at King of Prussia. S. J. Groves and Sons, Inc., was the contractor for the 2-mile section extending from West Conshohocken to Gulph Mills. Bethlehem furnished dowel units, bar mats, hook bolts and reinforcing bars.

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

### STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail  
Guard Rail Posts • Wire Rope and Strand • Pipe  
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Skip swings down for a new load. Bethlehem Dowel Units, visible between road forms, hold dowels in accurate alignment, horizontally and vertically. These units minimize load-transfer problems caused by heavy wheel loads.

When writing advertisers please mention **ROADS AND STREETS**, February, 1952

# ROADS AND STREETS

February, 1952 • Vol. 95 • No. 2

Roads and Streets represents 60 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher



HALBERT P. GILLETTE, Editor-in-Chief

H. J. CONWAY, Assistant Publisher

## Coming Articles

### Grading and Paving a Whole City in a Single Year

New modern soils engineering and road-building methods helped create Lakewood Park, California—thousands of new homes on miles of new streets "overnight."

### Lime Stabilized Soil Base For Texas Army Posts

Post road and street program by Army engineers to be described—based on experimental work in lime and lime-cement addition to soils.

### Planning World's Longest All-Welded Highway Structure

First section of elaborate expressway interchange and approach to San Francisco Bay Bridge now under contract. Design details and inspection control to insure quality welds are discussed by a bridge engineer aiding in project.

### How Can We Better Prove Need for Larger Road Programs?

"Sufficiency rating," newly developed scientific tool, to be described by Carl Fritts of the Automotive Safety Foundation, as discussed at last Highway Research Board meeting. Also, application of this technique to Virginia's highway needs.

### ALSO:

Nebraska tries fly ash in concrete pavement. Sevin's famous rail "loop" siding for aggregates on turnpike job to be described.

208-ft. high concrete piers, how designed and built for Kentucky reservoir bridges.

Several important articles coming along on road maintenance methods, street and expressway projects, airport runway design, experiences in past winter's snow storms.

Also on equipment maintenance and repair methods and how contractors and highway shopmen are stepping up this work to conserve equipment, parts, and steel.

HAROLD J. McKEEVER, Editorial Director  
C. T. Murray, Managing Editor  
Col. V. J. Brown, Associate Editor  
W. W. VanStone, Production Editor

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundation and grade separations, and to the construction and maintenance of airports.

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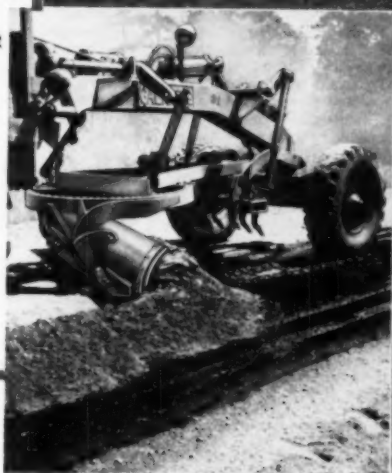
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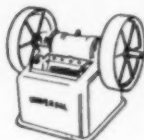
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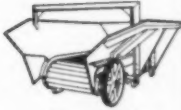
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### Contraction Joints...

Saw contraction joints in continuously poured slabs and eliminate costly hand forming and usual spalling. Building floors, highways, streets, runways, walks, etc. can all be sawed.

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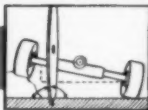
One of FIVE MODELS  
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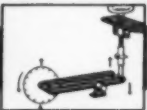
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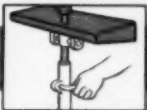
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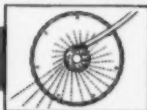
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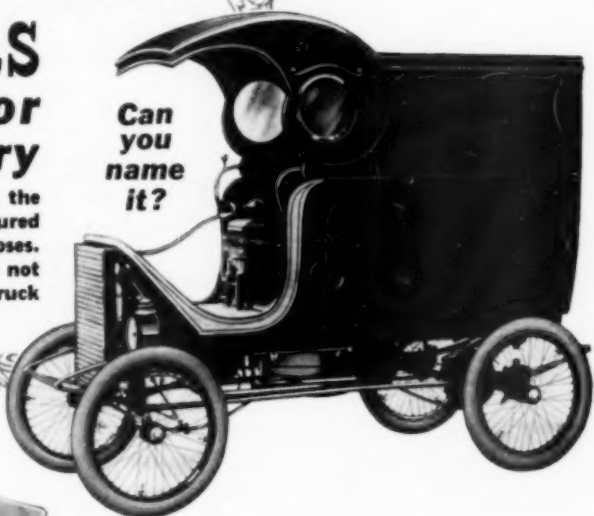
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This "old timer" was one of the first motor vehicles manufactured for commercial delivery purposes. It was built in 1900. If you are not sure of the name of this old truck — write to us.

Can  
you  
name  
it?



## PERFECTION Pioneer Builder of BODIES and HOISTS

In the early days of the motor truck industry, body problems were probably the least of the manufacturer's worries. However, motorized transportation soon became so universal that the large variety of body and hoist needs created a new and separate industry to better handle the many haulage problems.

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Write for literature today.

The photo at the left is an example of PERFECTION Bodies and Hoists to fill today's medium and heavy duty demands. This unit is a heavy duty style 354 Dump Body 144" x 84", with full cab guard; capacity 10 cu. yds. Hoist is a model 827 Iso-Draulic ROLL-A-LIFT.

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**FOR ANY TRUCK**  
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OF CONSTRUCTION EQUIPMENT



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that could  
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**TRACKSON COMPANY, MILWAUKEE 1, WISC.**  
A Subsidiary of Caterpillar Tractor Co.



• A heaped load of wet, gummy topsoil is dug and dumped into an old creek bed by the T6 TRAXCAVATOR, owned by SMH. The work is in connection with a new housing development.

# TRACKSON

**TRAXCAVATORS.  
PIPE LAYERS  
TRACLOADERS  
EARTH AUGER**



**//We have had very good luck on our 'Caterpillar' Diesel Engines without any repair costs.//**

**T. H. KELLY, Hot Mix Supt.**

A "Cat" D17000 runs the mixer, a D6800 the dryer, and a D315 the dust collector in the asphalt plant. A D17000 drives the portable crusher that supplies the aggregate. A "Cat" D6 Tractor with No. 8S Bulldozer stockpiles and feeds material at the plant.

## **He called it luck**

**but quality manufacture started it**



LONG PERIODS of good performance in any power-producing machine depend on these major factors: *Good design, good construction, good care and good dealer service.*

The four "Caterpillar" Diesel Engines powering the Peter Kiewit Sons' Co. crusher and hot mix plant near Agoura, Calif., are proving they have *all* it takes to do a good job — while thousands of their mates are doing likewise all over the world. Many have run up records of 50, 60, 70 and over 100 thousand hours of operation — and they are still on the job. By proved field performance, the "Cat" Engines mentioned here are still young.

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# **CATERPILLAR**

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EARTHMOVING EQUIPMENT**

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THE BIG RED CHAMP BUILDS UP THE WALL. The International TD-24 is the work champ of the levee and of the world. It's the most powerful crawler tractor made, and the fastest. Also a champ for "handle-ability," with fingertip control for pivot turns, feathered turns, and turns with power on both tracks. All this means it moves more paydirt per day.



## Four International crawlers help build wall to save town and mines from Ohio floods

Three times in five years the Ohio River rampaged through Rosiclare, Illinois. Each time it flooded the great fluorspar mines there, the biggest in the world, America's most important source of this vital fluxing agent used in making steel.

J. D. Barter Construction Co. was given the job of taming the river with a \$360,000 flood wall. Four out of the five crawler tractors he put on the project are Internationals, and Sam Barter tells why:

"They really do a job, that's why! And they

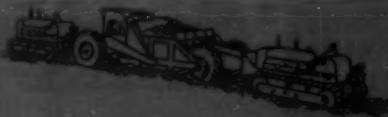
can take it as well as dish it out. We have one TD-18 with 3,000 hours that's never been touched. A TD-24 with 1,500 hours and not one minute's downtime."

Check with your own friends who own International crawlers. And ask your nearest International Industrial Distributor for details on the whole International line. He's always at your call with expert service both in his shop and at your job site. Get the low-down. You'll go International from then on in!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

# INTERNATIONAL

## POWER THAT PAYS



*only Allis-Chalmers can offer you*

# 1000 Hour

**for truck wheels, idlers, support rollers**



**FULL PROTECTION — only One Greasing Every 1000 Hours — with Allis-Chalmers Exclusive Positive Seal, Roller Bearing Design!**

Think of it! You can operate for 6 months on a 40-hour-week basis with just one lubrication of 14 to 20 of the most-abused, hardest-to-service points on a tractor. It's possible through an exclusive combination of glass-smooth Positive Seals and anti-friction bearings that help you do more work at lower cost even under toughest conditions! And it's another ahead-of-the-field design feature found only in the four new Allis-Chalmers tractors.

**These Big Benefits Mean DOLLARS to you!**

**DAILY GREASING PERIODS ELIMINATED.** You save at least 30 minutes every day . . . gain about one full month's production every year.

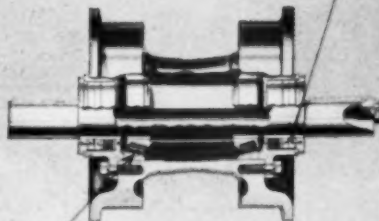
**FULL PROTECTION ASSURED.** Positive Seals keep grease in . . . dirt and moisture out. 1000-Hour Lubrication gives you protection unchallenged in the tractor field.

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*Here's the secret:*

**Positive Seals** each have two spring-loaded steel rings — one stationary, the other turning with the wheel. Ground smooth as glass, they seal the grease in . . . keep dirt, grit, dust, mud and water out.



**Tapered Roller Bearings** protect the Positive Seals by letting truck wheels, idlers and support rollers rotate freely...without side thrust or wobble. Reduced friction lets the tractor move easier, produce more drawbar power.

*the newest finest tractor line on Earth!*

HD-20 HD-15 HD-9 HD-5

**DESIGNED FOR YOUR JOBS • BUILT TO TAKE IT • EASY TO OPERATE • EASY TO SERVICE**



# Lubrication



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TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

*All welded...*

# PORTABLE

**QUICKLY MOVED TO  
REDUCE HAUL DISTANCE  
OF MIXED CONCRETE**

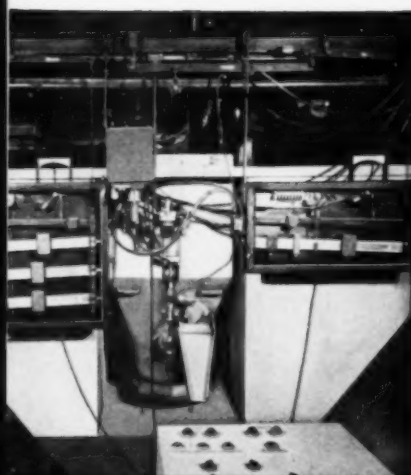
**H**ERE is a profitable way to reduce haul distance of mixed concrete. Portability of this Johnson Transit-Mix Plant answer. Portable-section Tandem Bin minimizes field bolting . . . dismantling and erecting takes less than half the time required for moving a bolted plant. All sections are easy-handling width . . . 11' or under . . . yet, bins have big storage capacities. 7 sizes range from 55 to 210 cu. yds., can be arranged for 2, 3 or 4 aggregates. Central cement compartment holds 61 to 185 bbls. In addition to quick portability and big capacity, also check flexibility of this Tandem Bin Transit-Mix Plant. See your Johnson distributor, or write us, for more facts.

**C. S. JOHNSON CO.** CHAMPAIGN, ILL.  
(Koebling Subsidiary)  
C-101



## JOHNSON *Mix Plants*

BINS • BATCHERS • SILOS • ELEVATORS • CHARGERS • HOPPERS • CLAMSHELL, CONCRETE BUCKETS



### Automatic, air ram operated CONCENTRIC BATCHER

This exclusive Johnson Concentric Aggregate-Cement Batcher, with central cement feed is fully automatic, air ram operated. Finger-tip panel (shown in foreground) controls air rams on aggregate and cement fill valves and discharge . . . assures extreme accuracy of top batching speeds for most efficient use of materials. Batcher also can be furnished with manual controls. Aggregates arranged concentrically around cement prevents "gumming". Cement is weighed on separate scale; aggregates are weighed on individual beam scales . . . or an accumulative dial scale.



### WATER BATCHER improves concrete quality

Here's another handy auxiliary unit that can help increase your mix plant efficiency — Johnson Water Weigh-Batcher. Capacities: 120 gallons or 1,000 lbs. for batches up to 2 yards . . . and 240 gallons or 2,000 lbs. for batches up to 5 yards. Semi- and full-automatic types. They're fast-weighing . . . batching accuracy is not affected by changes in water temperatures.

### 13¾-FT.-PER-MIN. Parsons 221 Trenchliner\*

With 30 digging feeds, 221 Trenchliner excavates 6½ in. to 13¾ ft. per min. It digs 16 to 36 in. wide, 8½ ft. deep, cuts within 10 in. of side obstructions. Equipped with easy-in, easy-out "Tap-In" teeth. Has full reverse of all operations . . . undercuts, makes vertical set-ins. 1-min., power-shift conveyor dumps spoil on either side. Check all Parsons wheel and ladder-type models, full crawler mounted, also rubber-tired utility Trenchliner.

**PARSONS** (Koehring  
Subsidiary)  
Newton, Iowa



### FAST GRAVITY DUMP with Kwik-Mix Moto-Bug\*

Moto-Bug has instant gravity dump with snub-line control . . . no body hoist mechanisms. This 10 cu. ft. power wheelbarrow also has full power forward and reverse . . . no push, no pull necessary to travel, back, or spot. Climbs 20% ramps fully loaded. Has interchangeable 1500-lb. flatbed, 500 or 1000-lb. fork lift, also scraper blade. Other Kwik-Mix units: 3½-S to 16-S Dandies® concrete mixers, bituminous and plaster-mortar mixers.

**KWIK-MIX** (Koehring  
Subsidiary)  
Port Washington, Wis.



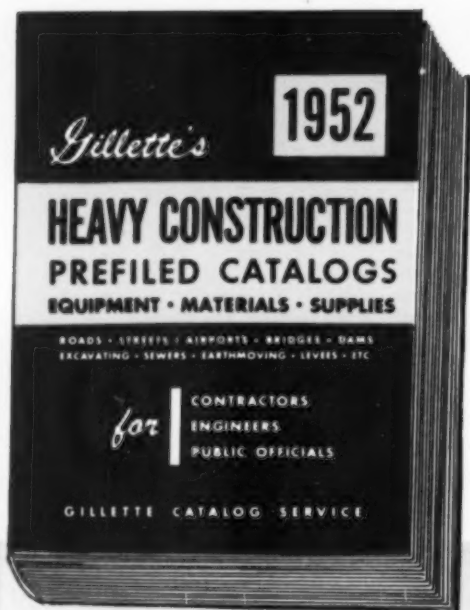
### NO TURN at loader with Koehring Dumptor\*

Fast-shuttling Koehring Dumptor® eliminates slow turns at loader, on narrow haul roads, and at the dumping location. With constant-mesh transmission, Dumptor travels same speeds forward and reverse . . . gets its load, drives to fill, dumps and returns to loading unit without turning. Eliminating only 2 turns saves ½ minute on every cycle. Instant gravity dump cuts another 15 to 25 seconds off haul cycles with heavy-duty Dumptors.

**KOEHRING COMPANY**  
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**40 hand laborers**

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*What every highway engineer  
should know about  
the Maryland Test Road*

**Not a single structural crack developed  
in any of the 28 forty-foot concrete slabs  
built on non-pumping, granular subbase**

The Maryland Test Road, 1.1 miles long on U. S. 301, was a two-lane concrete pavement of 9"-7"-9" section. When it was built in 1941 pumping had not become a problem. Consequently most of the concrete pavement was placed directly on the natural fine-grained subgrade. However there was a non-pumping, granular subbase under 28 forty-foot slabs.

For nine years the pavement in this test section carried all normal traffic *plus* the heavy wartime traffic. Then for six months the pavement was subjected to accelerated truck traffic equivalent to at least 20 years of normal traffic on this road. Yet the 28 slabs on granular subbase carried 238,000 trips by trucks with single axle loads of 18,000 lb. in one section and 22,400 lb. in another section without any structural cracks. These slabs are in as good condition as when opened to traffic.

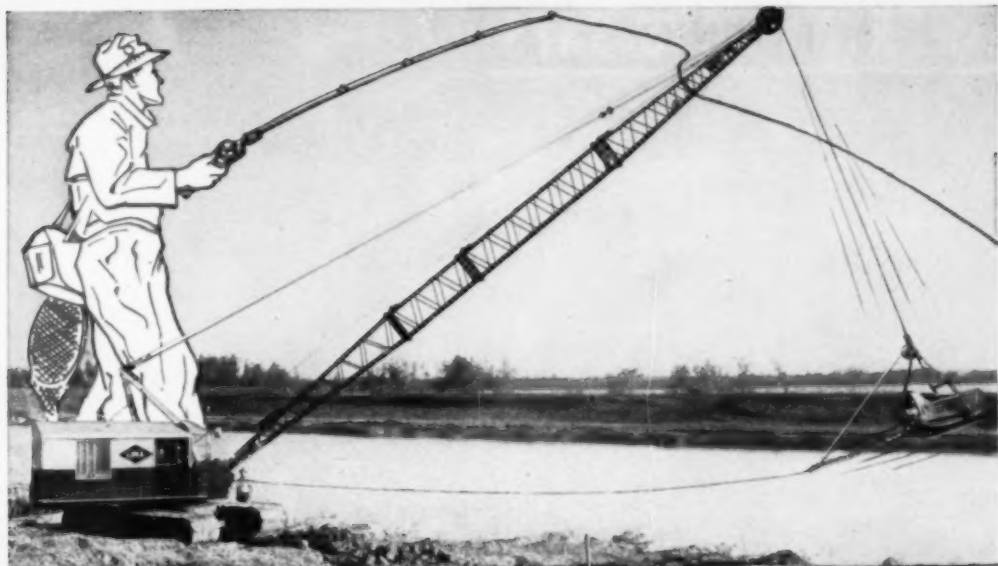
Since the Maryland Test Road was built a decade ago there have been many improvements in concrete pavement design and construction. With today's knowledge of soils, highway engineers can determine subgrade bearing values and any tendency of soils to pump. A thin insulating layer of granular material, where needed, will prevent pumping.

Thus the engineer can design a concrete pavement that will give unexcelled service under an unlimited number of legal axle loads and render this service at lower annual cost than any other pavement.

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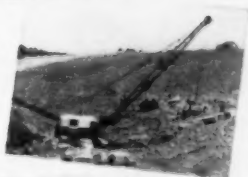
When you're fishing, and want to drop the bait in the far pool where the big ones are waiting, your reel's got to be friction-free to let that line flow out, smooth as cream from a jug. And, after the strike, come in the same way.

When you're after record yardage, a smooth flowing line is just as vital . . . so we took a tip from the fisherman, and made our reels friction-free. You can 'cast' the dragline bucket further, increase your radius of efficient operation from each location. You can bring in bigger catches, because more power is going into the work lines and less into friction drag on the machinery. And there's further big benefits from reduced maintenance . . . less frequent lubrica-

tion, and smoother operation, because misalignment from bearing wear, that affects clutch alignment and functioning, is eliminated.

Lima pioneered the use of anti-friction bearings at all important bearing points on draglines, shovels, and cranes. They've kept on pioneering with other improvements that put Lima equipment in the top rank of profitable performers. If you want proof of this—just ask the Lima user. If you want details on how to put Lima equipment on your pay-off roll . . . just get in touch with us.

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**P. W. RYAN SONS SAYS:**



## **“There’s a place for the ‘D’ on every big production job”**

Superintendent Tom Ryan, speaking for his firm, one of Wisconsin's largest contractors, continues, "Our 7-yd. Tournapull is a good finishing tool . . . fine for trimming cuts . . . cutting 3-to-1 and 4-to-1 backslopes . . . just the right width for ditching. It works just about anywhere. It doesn't need a push to get a good load . . . it's fast on long hauls and in traveling from job-to-job."

The Ryan company, veterans of 40 years in the dirt-moving business, move most of their scraper dirt with a fleet of 7 Super C Tournapulls and 6 tractor-drawn W Carryalls. Their 122 h.p. D Tournapull, usually used as a self-loading tool, does a large share of the fine-detailed finishing work on the company's big jobs . . . also handles small municipal contracts between major assignments.





**"DOESN'T NEED A PUSH"** Placing earthfill on U. S. 14 near Walworth, "D" had to haul through open traffic estimated by State Engineer at 5,000 cars daily. Self-loading wet loam and gravel, it made 12 trips per 50-min. hour over 800' cycles. On backloping and finish-grading, Superintendent Tom Ryan estimates the "D" averages 100 self-loaded trips per 10-hour day.



**"VERY FAST FROM JOB-TO-JOB"** D Tournapull's light weight (22,450 lbs. empty), narrow width, and low-pressure tires allow roading the rig anywhere. It crosses railroad tracks, bridges, drives through heavy city and country traffic safely at speeds up to 28 m.p.h. . . . has averaged around 20 m.p.h. on 5 job-to-job moves to date.

### Works on 5 jobs in 4 months

First task for the electric-control "D" last season, for example, was as a clean-up rig on a 150,000-yd. county road near Verona. From here, it was driven 37 miles to stockpile topsoil and help grade 100,000 yds. on the Monroe-Monticello Hwy. That work completed, the "D" drove 66 miles (in 3½ hours) and, teamed with a second "D" on rental from Rockford Construction Co., moved 11,000 yds. to widen 10 miles of Hwy. 14 near Walworth. Next, Ryan's Tournapull, working alone, regraded 4 Janesville city streets, self-loading 4,000 yds. in 2 weeks. The versatile rig is now in Black River Falls, 190 miles north of Janesville, on its 5th job — finishing for a 400,000-yd. highway relocation. In all, Ryan's handy Tournapull worked 700 hours during this typical 4-month period, drove 330 miles job-to-job . . . overall, was 95% mechanically efficient.

William H. Ryan, partner in the Janesville company, says, "The 'D' by no means replaces larger units, but in a great many places it does much better than the big units. We're constantly finding new uses for it. It's just like a pair of pliers . . . does a lot of small but very necessary operations efficiently. It has a place on every job."

**R. G. LeTOURNEAU, INC.**  
Peoria, Illinois



**"EASY TO HANDLE IN TIGHT SPOTS"** "No rig that I've run has been so easy to handle," says Bob Ritchey, Tournapull operator. "You can't beat 'em on long hauls. They're nice on the highway, easy to get in and out of tight places, easy to work on a 3-to-1 backslope, have plenty of power." Rig is shown, above, grading parkway in Janesville; below, turning on highway after grading shoulder.





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loose sand footing doesn't  
stop four-wheel-drive.

*Above  
Ground*



*or  
Below*

HOLLAND TUNNEL pavement removal demands precise control, plus power.

## PAYLOADER®

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**P&H****SINGLE PASS  
PROCESSING METHOD****for better road construction  
ON ALL KINDS OF JOBS**

Whether it's for airports — highways — streets — bases for light traffic or sub-bases for heavy traffic . . . the P&H Single Pass Processing Method gives you the speed, quality control and economy unequalled by any other method. It's *proved* on all kinds of soil stabilization work including granular, bituminous or cement. Note these typical jobs shown here.



Louisiana. Model LA-106. Soil cement streets at Crowley were processed to depth of 6", reclaiming former crushed stone base.



Oklahoma. Model LA-88. Soil asphalt base 8" deep by 24' wide. Low plasticity soil (25% — 35% sand) is treated with 4% — 6% cut-back asphalt.



Minnesota. Model LA-106. Airport runway at Winona used A-3 sand fill processed to 3" depth with MC-3 cut-back asphalt to form base for 3" surface of plant mix.

North Carolina. Model LA-86 (with special mixing box) processes soil cement base. This machine has produced millions of square yards of soil cement.

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**3 Models to meet all job requirements** — from 5' to 10' widths and maximum processing depth from 6" to 8". The P&H Single Pass Processing Method assures better control — makes supervision easier, requires less equipment, conserves materials. Write for complete details and job data.



New Jersey. Model EA-56 (with five foot mixing box) processes soil cement streets of sandy clay loam requiring 11% cement for treatment.



California. Model LA-88 processing cement base — gravel treated with low percentage of cement. Opened to traffic immediately after final rolling.



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Interesting — instructive! The whole story of the P&H Single Pass Processing Method in pictures! One film shows complete job on soil cement; the other on soil bituminous construction. Both films available — free. Write us.

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Adapting tools allow the Ottawa Hydra-Hammer to make quick, easy work of such operations as backfill tamping, concrete breaking, asphalt cutting, post driving or filling, rock tamping, ice chipping, and many others, with **SAVINGS UP TO 50%!**

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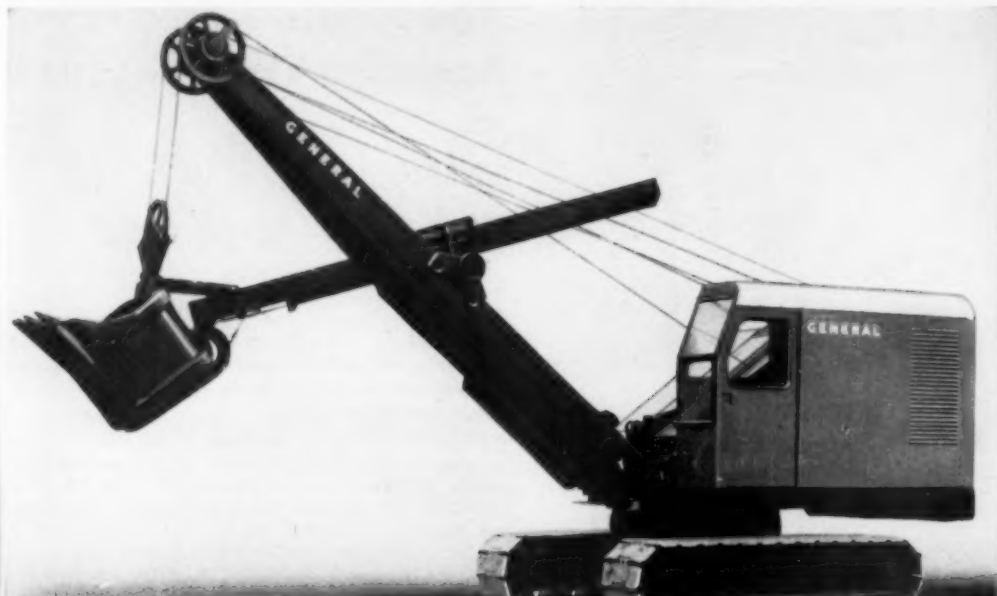
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## Extra work-capacity of new $\frac{3}{4}$ -yard shovel SAVES YOU MONEY

GENERAL's new  $\frac{3}{4}$ -yd. Shovel Model 320 is specially engineered to save you money through extra work-capacity and longer service life. Every feature is built to reduce maintenance, cut down-time, and provide outstanding performance. Fewer points require adjustment or lubrication. Hook rollers, drums, and shafts are all mounted on anti-friction bearings sealed for life of machine. Oilless bushings are used for all lever connections. Locknuts guarantee safe, permanent fastenings. Simplified design assures permanent alignment of

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CRAWLER, TRUCK OR WHEEL  
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CAPACITIES  $\frac{1}{2}$  TO  $2\frac{1}{2}$  CU. YD.





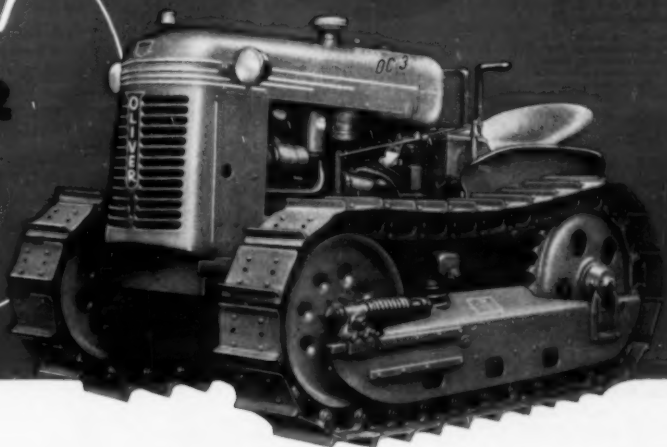
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*...far better*

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*the NEW*  
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Here's the greatest little crawler tractor you've ever seen . . . the new Oliver Industrial "OC-3". It's ideally balanced for most effective loading and dozing . . . engine is mounted *back* so that front of tracks and radiator are practically in line. This better balance gives you 40% more lift with a front end loader . . . does a superior job of dozing and grading because blade is mounted close to the tracks for easier handling . . . precise control! And, operators find this bal-

anced tractor far easier to handle . . . far less fatiguing.

The new Oliver Industrial "OC-3" gives you a full 22 drawbar horsepower . . . plenty of power for jobs in its size. It's ruggedly built for the tough jobs . . . keeps maintenance costs down. Complete accessibility makes servicing easy.

For the complete story on the new Oliver Industrial "OC-3" and how it can help your operations, see your Oliver Industrial Distributor.

## THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

*A complete line of industrial wheel and crawler tractors*



## WALLS

Your Standard MultiFoote HighLift Boom will pour up to 23 ft. (we have built booms up to 59 ft.). Go away with crane, ramps and stages.



## FOOTINGS

Crawlers take the MultiFoote where wheels would need mats, between footings and over the rough going of the usual construction job.



## FLOORS

The MultiFoote works with either a flat boom or HighLift without reeving cable. Plenty of clearance under the bucket. Big bucket capacity.



## ROADS

With a MultiFoote you are equipped to bid on road work or general construction. Even the 27-E will handle the small road job.



# Equip for ANY POURING JOB!

THE MultiFoote brings you *paver speed* to all your concrete pouring jobs. Paver mixing gives you mixing control! With the HighLift Boom you can pour direct to forms or buggies. You can feed hoppers or Pumpcrete. You can load high truck bodies. The HighLift Boom eliminates the crane, cuts waste, reduces the number of buggies required and frees labor for other work.

Lower the boom and you are ready for floors, or on housing work you can pour walls, walks and curbs, practically in one operation. Crawler traction takes you over "rough going" for pouring footings or retaining walls.

And, there is a size MultiFoote for any job. If the 27-E, with its 50 batches isn't big enough, there is the 34-E Single with 50 batches (34 cu. ft. to the batch), or the DuoMix with 86 batches (34 cu. ft. to the batch).

They're fast. Big, open-end skip takes the batch truck without bumping; big buckets with ample clearance beneath them. Easy control, fast charge and discharge. Don't figure a pouring job without finding out what the MultiFoote will do. Get *all* the facts! Don't be misled by theoretical capacities.

## THE FOOTE COMPANY, INC.

Subsidiary of Blaw-Knox Co.

1936 State Street • Nunda, New York

# MULTIFOOTE

## HIGH LIFT BOOM

FOR EVERY PLACE CONCRETE MUST BE POURED





**PROBLEM:** Excessive water in the subgrade causes highways to break up.

## It Puts Sodden Subgrades "On the Wagon"



Highway subgrades "sign the pledge" when Armco Perforated Pipe is installed. This subdrainage pipe drains away unwanted water and keeps it out! Then subgrades remain dry and firm and expensive pavements no longer crack up from thawing and freezing.

Surface repairs are only a temporary answer, and this costly job usually has to be done year after year. The only permanent solution to this problem is to remove the cause of the trouble. Armco Perforated Pipe does just this!

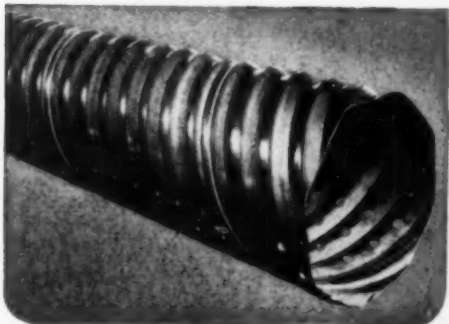
Installing an Armco Subdrainage System is easy for any unskilled crew. They dig the ditch; lay the lightweight Armco Perforated Pipe in the bottom; join the long 20-foot sections with simple coupling bands; and then start back-filling immediately. There is no waiting, no time lost. Installed costs are low.

A sturdy Armco Subdrainage System will not crack, crush, or disjoint under heavy loads. And it is not affected by severe frost action or shifting soils. Clogging is no problem.

Specify Armco Perforated Pipe for complete road drainage systems or for correcting trouble-spots. Write for more data. Armco Drainage & Metal Products, Inc., 1472 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation.

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**SOLUTION:** Armco Perforated Pipe drains underground water, keeps it out.



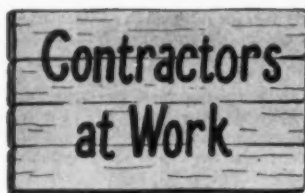
## ARMCO PERFORATED PIPE



# Special 22-Ton Ripper

## Helped Airport Contractor Whip Cemented Soil

**How three well known Western contractors teamed up to meet Navy's fast schedule for enlargement of Miramar Airbase**



**C**EMENTED conglomerate, tertiary sandstone and other stubborn formations which skimmers appropriately call "Mexican Concrete" have been especially tough at Miramar, California, where Morrison-Knudson Co., Inc., is sponsoring a joint venture contract for the Navy Bureau of Yards and Docks. Other partners with M-K include Macco Corporation and Ford J. Twaita Co. The job is a \$3,370,000 major expansion of the Miramar Auxiliary Naval Air Station, designed to make it the jet center of the Pacific Coast for Navy air.

The job is an interesting example of practical difficulties which result on virtually any project when the owner's designers need high quality work on one hand, and where the contractors have to whip bad conditions on the ground on the other hand. At Miramar, a major airbase designed for 120,000 lb. wheel loads is being developed in a formation so tough that manganese steel ripper teeth often wore through or broke in 15 minutes.

Only the finest kind of teamwork between Navy engineers and contractor's field crews made the project possible and pleasant.

In order to make Miramar into a modern jet base, Navy engineers designed an 8,000 ft. main runway, a 6,000 ft. taxiway; and 2 large plane parking aprons.

From either an engineering or construction view, the design is modern and it achieves a nice balance between economics and contemplated use of the airbase. For example, the 8,000 ft. runway has 1,000 ft. of 12-in. portland cement concrete paving at each end, laid on 12-inch thickness of select base

with a CBR rating of 30 to 80. This concrete paving, like the rest of the concrete in the project, is being divided with JFR (jet-fuel resistant) joint material. The center portion of the runway includes 27 in. thickness of select sub-base and a 3-in. thickness of asphaltic concrete pavement. Made with 85-100 penetration asphaltic cement, this pavement is designed for a Marshall stability rating of 1500.

The 6,000 ft. taxiway and the two large plane parking aprons are 12-in. portland cement concrete. Compaction of native earth in all subgrades is designed to develop a minimum of 90 per cent of Modified AASHTO density,

★ This is the 22-ton special ripper used on the Miramar project







★ Power of three tractors was sometimes used to get the maximum footage and penetration with the big ripper. D-8 Caterpillars

and subbase compaction values are 5 per cent higher.

Other features in the design include surface penetration treated shoulders 75 ft. wide; a high-intensity lighting system and other modern navigational aids; and an approach plan calling for a glide angle of 50 to 1.

#### Special 22-Ton Ripper

The 620,000 cu. yd. grading job which made room for base and paving courses was one the excavation specialists of Morrison-Knudsen will long remember. Broken ripper teeth, snapped shanks and ripper skirts, bent drawbar pins and dulled cutting edges on scraper bowls all bear mute evidence of a brutal assignment in changing the grading plan of the field.

The contractors knew it would be difficult before they moved in, for the Miramar airbase sets on a high plain of tertiary sandstone and cemented conglomerate and other recent geological formations. With the yardage scattered over an extremely wide area and maximum cuts only 9 to 10 ft. deep, the use of methods other than powder was clearly indicated.

The contractors decided to make a try at breaking up the cemented formations with rippers, and to haul with two equipment spreads. A special 22-ton ripper, shop built several years

ago for Van Valkenberg Construction Co. of Los Angeles, was rented. This machine had a single tooth shank of solid steel, measuring approximately 4 by 6 in. and tipped by Esco or H & L teeth at various times in the course of the work. Several methods of pulling this machine were used. Two Caterpillar D8's in front and one D8 pushing were successful. A special twin D8, made by joining two D8's together on a common driveshaft, was also used with success.

The brown, cemented formation was unusually stubborn; however, and in spit of its weight, the giant ripper was successful only to a ripping depth of about 22 inches. When the heavy frame and ripper tooth soaked down into this formation, the earth broke out in large chunks as dust and smoke flew from the terrific frictional heat generated between stone and steel. If enough power was put on the ripper to move it through the formation, ripper teeth often burned through or snapped off in only 15 to 20 minutes of operation. And if the ripper was under-powered, little or no ground was broken. The problem was solved only by bringing in plenty of ripper teeth and keeping a welder busy at the repair shop. At no time did a tooth last longer than 2 hours, and even the shanks and skirts frequently broke.

#### Tough Scraper Job

And when the formation was ripped up, it was anything but an easy loading assignment. The two hauling equipment spreads consisted of 5 Wooldridge Terra Cobras, assisted by two D8 Caterpillar push tractors in the pit for hauls in excess of 2000 feet. For shorter hauls, a fleet of 7 Wooldridge 14-yd. scrapers, pulled by D8's and assisted by two D8 pushers, were used. Auxiliary equipment for both spreads included five D8-mounted dozers, a Caterpillar DW10 wagon and dozer, a Southwest sheepfoot roller and a Southwest 50-ton pneumatic compactor, and two Huber 3-wheel steel rollers. Two Euclid water tank trucks of 3000 and 4500 gal. capacity, also were used when the material was dry.

Once the peculiar cemented material had been gouged out and loaded, it seemed to lose much of its chunky stubbornness. When the loads were dumped on a fill, and a dozer smoothed them out, the material broke down fairly well. The passage of a sheepfoot roller or the 50-ton Southwest compactor also broke up the chunks and pulverized the formation. If water was sprinkled on, and the material was exposed to air or wind, it would slake down rapidly. Thus it was possible, by moderate processing with water trucks, spreading equipment and the 50-ton compactor, to develop 90 per cent densities with about 6 passes of the roller, provided the lifts were kept down to 6 inches or under, uncompacted thickness.

In one area, a surface formation of black adobe from 6 to 12 in. thick was removed and wasted because of its low bearing value. The space occupied by this material was then replaced with sub-base material to bring it up to grade.

Because of subcontracting arrangements for sub-base and pavement, it was necessary for the prime contractors to finish off the earthwork to very

★ Once properly loosened, the soil was easily loaded with scrapers. Wooldridge scraper and TD-24 International tractor with D-8 pusher



close tolerances. Survey bluetops set every 50 ft. governed the final grading by a Caterpillar No. 12 motor grader. The finished earthwork was smooth to within  $\frac{1}{4}$  in. in any 10-ft. distance, the machines then moving on to another area. Pneumatic rolling up to the very top of fills assured final compaction through the top of the last lift.

The grading operation moved ahead rapidly, despite the discouraging situation on ripping. By December 1, grading operations which started August 1, 1951, were largely complete. In the peak months of September and October, approximately 225,000 cu. yd. of earth was handled by the equipment, working 6 days a week on a single 9-hour shift basis.

Noteworthy, too, was the demolition work in connection with grading. Seven ammunition magazines, one hangar, 14 buildings of various sizes and types, and 12 concrete revetments stood in the way. The latter structures had concrete walls for 12 to 17 ft. high and from 4 to 8 ft. thick. They were drilled with Ingersoll-Rand jackhammers, shot with heavy charges of powder and loaded out by a Northwest 80-D shovel.

#### Granular Sub-Base Laid

The sizable tonnage of granular sub-base material, along with portland cement concrete paving, is being sub-contracted by Stanley Ball & Co. Caudell & Johnson, materials-supply contractor, is producing the rock in turn for the Ball outfit, and a large plant is set up in the bed of a dry wash about  $1\frac{1}{2}$  miles from the job for the production of sub-base material. Concrete aggregates for the pavement mix are produced in a separate plant at Poway, Calif., about 11 miles distant.

Specifications for the granular sub-base call for a well graded product of from  $2\frac{1}{2}$  in. to 200-mesh, with a Plasticity Index of not more than 6 and a CBR value of 30 & 80. Because of the PI requirement, it is necessary to crush about 15% of the 2-in. material passing through the plant screens.

The Johnson organization has turned out 4,000 tons a day in 8 hours through a combination crushing-screening plant. Raw pit-run material moves from its natural location to the plate feeder by three Super C Tournapulls. Two dozers shoved dumped material into the trap. Plant components include a Diamond 20 x 36 jaw crusher, a Cedarapids 15 x 36 jaw, two Garfield 54 x 20 roll crusher units, and a Cedarapids double deck vibrating screen. Allis-Chalmers diesel engines drive the jaw and roll crushers, while the screen and conveyor belts are powered by



★ Lieut. Commander H. A. Fowler inspecting a drainage ditch line as the contractor resumes following a heavy rain. Lima backhoe



★ Base course aggregate is being road mixed ahead of paving operations. Caterpillar No. 12 motor grader

★ At the end of a pouring lane, a Tournac crane is seen picking up a Jaeger spreader for moving to the next lane





★ Dipping pavement dowels in lead. Specifications for the Miramar pavement required coating dowels and greasing for half their length



★ Dowels with dipped ends placed in alternate directions are shown assembled here for a contraction joint

electricity from a Caterpillar diesel-electric generating set.

The finished product comes off a stacker belt to a 30-yd. surge bin, which loads the hauling units.

The development of a strong base is one of the most important phases of the project. With 15 in. of sub-base and 9 inches of base material under asphaltic concrete pavements and a minimum of 12 in. of sub-base under the concrete slabs, high tonnages are involved. It takes a fleet of six Caterpillar DW10 wagons, shuttling back and forth between the plant and the field, to keep the plant output hauled away.

As the DW10's dump the crushed rock, two motor graders roadmix the windrows to blend the fine and coarse rock particles thoroughly. Moisture is also added, to bring the water con-

tent to about 9% for compaction to best density. Loaded DW10's, with a total weight of 26 tons, are used for compaction. The granular base material is spread in 4-in. lifts. Navy inspectors are present to help the operators get full blanket coverage over the area.

Granular sub-base is finished out to close tolerance to survey blueprints, set every 50 ft. The finished grade is made sufficiently smooth so the setting of concrete forms will be as easy as possible, leaving only a minor amount of finegrading and final compaction to be done during the paving stage.

#### Concrete Paving Details

With the exception of a very few transition sections, all the 12-in. concrete pavement is laid in standard 25-ft. lanes. The concrete is plain in the parking areas; in the runways, reinforced with  $\frac{3}{8}$ -in. mesh steel. The outer edges of the outer strips are thickened to 16 in.

The Ball organization brought 8,000 road-feet of Blaw-Knox steel paving forms into the project, to be able to keep a lane formed about 2000 ft. ahead of the paver. These forms are standard sections with 9-in. sides on an 8-in. base. A 3-in. timber, bolted to the base of the forms, provides the 12-in. height required.

It has not been necessary at Miramar to cut a form trench. So close do the motor graders leave the granular sub-base to grade that the forms are easily set to a string line, and tamped with a little sand by hand. The form pins, however, are driven through the tough sub-base by a LeRoi portable compressor and a small pneumatic stake-driving gun. Then a Lewis sub-

grader moves down the line to scoop away the minor amount of material left over the grade. A Huber 12-ton steel 3-wheel roller does final compaction, leaving the base ready for pavement.

#### Efficient Key Form

Pavement joints are standard, with the exception that 1 $\frac{1}{2}$ -in. dowel bars on 15-in. centers are used at transverse dummy joints, usually spaced 15 ft. Expansion joints are placed in the runway section at 240-ft. intervals. These consist of  $\frac{3}{4}$ -in. mastic material, with 1 $\frac{1}{2}$ -in. dowel bars half painted with red lead and greased to permit pavement movement over the steel. These dowel assemblies are made up on a steel chair, for quick setting ahead of paving.

The Ball organization is using an unusually efficient steel key form, fastened to the sides of the form sections by a small grommet and key, to form the  $\frac{1}{2}$ -width keyway and contain the tie bars. This keyway form has slotted openings at proper spacing to permit one half of the tie bar to slide inside, between the keyway and the main form. The bar extends into the slab, with a 90-degree down bend on the last 6 in. to act as a supporting chair. When the lane is stripped the key wedges are simply knocked loose, the forms are lifted away, the unused half of the dowel steel is then bent out straight, and the keyway forms are removed.

Concrete is being mixed by a Multi-foote 34-E Duomix paver, operating alongside the pouring lane. Batch trucks with four 1 $\frac{1}{4}$ -yd. dry batches bring load from a Hardy automatic batch plant, set up near the sub-base production center. Mixing water, from



★ Field conference by Commander Fowler, with Byron Thornburgh, R. M. Hapgood, general superintendent of the N. M. Ball organization, and project manager B. H. Prouty Jr. also of the Ball firm

field hydrants on the station, is delivered to a 2,800-gal. trailer towed by the paver.

The paving equipment lineup, in order, includes a Jaeger concrete spreader, a Jaeger-Lakewood finisher, and a Flex-Plane joint installation machine. Considerable hand finishing with long-handled floats is done behind the last finishing machine, and a final pulled burlap finish is left on the parking apron concrete. A transverse pulled broom finish is made on the runway concrete. A curing coat of Hunt Process clear membrane is applied. Forms are stripped the day following the pour. Form pins are pulled by Cleveland extractors.

Good daily footages are being made, the general average to date per 8-hour shift running 1,040 linear feet of 12" x 25' slab.

The batch plant uses sand, ¾-in. stone, 1½-in. stone, and 2½-in. stone, from the Poway supply. Colton bulk cement is trucked in for the dry mix; 8 batch trucks supply the paver.

When the ROADS AND STREETS correspondent visited the Miramar project, the hot-mix asphaltic concrete paving had not yet begun, but a subcontract had been let to R. E. Hazard & Co., of San Diego for supplying and laying this material. The Navy mix will use 85-100 penetration asphaltic cement, and production and laying methods will be normal. The asphaltic concrete will be laid in two 1½-in. courses.

#### Acknowledgments

All construction operations are under supervision of Captain A. I. Flaherty, District Public Works Officer and Commander Lewis C. Cox, Asst. District Public Works Officer of the 11th Naval District, San Diego. Commander W. F. Weaver heads up office design and construction matters while Lieut. Commander H. A. Fowler is Resident Officer in Charge of the contract at the Miramar base.

Don Hall heads up the Morrison-Knudsen Co. force at the field and H. W. Overton directs the excavation and grading work. J. F. McKee is Project Engineer; E. W. Weatherman is Office Manager; John Christman is General Superintendent; and Reuben Anderson is Master Mechanic. D. G. Prouty heads the Ball paving organization, assisted by R. H. Haggood in the field.

By March 1, 1952, present construction work is expected to be complete, making the field one of the most modern jet centers on the west coast.

#### Round Up Your Scrap

## Some Equipment Will be Scarce, A.E.D. Members told

The Associated Equipment Distributors' 33rd annual meeting, held January 27-31 in Chicago, was a record smasher with over 2600 registered visitors. In a varied program the delegates representing the nation's construction equipment dealers and manufacturers heard discussion on business and industry problems. Among the highlight developments:

Restrictions in manufacture and supply will hamper the sellers and users of construction and roadbuilding equipment in 1952. As reported by J. R. Steelman, president of Construction Industry Manufacturers' Association (and newly-elected president of the Koehring Company), manufacturers in this field will be restricted to a level of material use representing about 75% of industry peak production capacity.

Availability of particular types of equipment will present an uneven picture, said Mr. Steelman. In general, heavy tractors and medium shovels will be hard to get, while smaller crawler tractors, aggregate plants and certain other types will be produced more in balance with anticipated demand. Graders, as in World War II, will be scarce in the heavy models. Scraper supply will vary with the make and model. Asphalt plants and black top pavers will be largely a "casualty of the Korean war" with the military siphoning off much production. Concrete finishing machinery will be available for civilian use. Paradoxically, many small items of construction equipment—those not gobbled up in volume for military use—will be plentiful.

Construction of types which will require heavy machinery is likely to have the spotlight in 1952, as housing and certain civilian building construction is restricted. Identifiable defense and military construction volume of 3½ billion is planned. Plant expansion of war industries will boom. A \$28 billion construction year is forecast, compared with the record \$30 billion of 1951, said Walter Couse, past president of the Associated General Contractors, another convention speaker, who noted that construction plus plant maintenance represented the largest U.S. industry, surpassing agriculture and creating one pay check in eight.

Scarcity of certain controlled materials, notably steel and copper, were blamed for NPA denial of many ur-



★ A.E.D. President Harry J. Hush

gent projects seemingly high in the public and defense interest. Conspicuous among these are urban expressway projects—during the AED meeting Chicago officials were reported in Washington seeking steel for overpasses and bridges for additional links on the city's \$134,000,000 Congress Street, the Outer Drive northern extension, and similar projects. Milton S. Rosen, St. Paul, Minnesota, immediate past president of the American Public Works Association, addressed the convention, pacing a government-affairs program.

The vital importance of construction equipment to economic strength and defense preparation of the nation was outlined by Harold Hess, executive vice-president, Construction Industry Mfrs. Assn. Mr. Hess has spearheaded a program to compile and more effectively present facts on the vital role of construction machinery.

#### Hush Heads AED

Harry J. Hush moved from vice-president to the presidency of AED for 1952. Other election details: Executive vice-president, S. John Oechsle, Metalweld, Inc., Philadelphia. Three new regional vice-presidents: G. W. Gagel, Machinery & Supply Co., Kansas City, Mo.; Frank Skidmore, Contractors Machinery & Supply Co., Albuquerque, N. Mex.; and J. G. G. Morgan, Vancouver Equipment Co., Lt., Vancouver, British Columbia.

New AED directors are S. John Oechsle (see above); Ashley Carroll, Eastern Equipment Sales, Inc., Springfield, Mass.; M. C. Bishop, Tri-State Equipment Co., Atlanta, Ga.; L. M. Doolen, Telford Equipment Co., Lans-

(Continued on page 104)



## Equipment Maintenance Today is a "Top Brass" Job

Here we are again, in a time of equipment scarcity. Military requirements will take a bigger share of the construction machinery output in 1952. Road contractors and highway departments will have a tough time getting certain kinds of machines and parts for a while.

As some people in Washington were slow to grasp, construction and road equipment inherently wears out fast and has to have plenty of spare parts. But even contractors don't all appreciate what a large percentage of job operating costs go for repairs and replacements. Very often the percentage is more than half, one contractor has reminded. E. H. Honnen, of the McCoy Company, in Colorado, speaking at the Earthmoving Industry Conference of the Society of Automotive Engineers at Peoria last spring, reported the following figures for a large typical earthmoving job west of Denver. These costs are for repairs and replacements in relation to total operating cost, omitting operating labor:

Tractors and attachments with a total of operating cost of \$6.89 per work hour, required \$4.44 per hour or 64% for repair parts and repairing expense.

Motor graders costing \$2.70 per work hour, \$.99 or 37% for repair parts and repairing expense.

2½ yard shovels costing \$18.40 per work hour, \$12.10 or 66%.

3½ yard shovels costing \$20.70 per work hour, \$14.42 or 70%.

13½ yard bottom dumps costing \$5.62 per work hour, \$2.97 or 52½%.

These costs were based on two working seasons, working two 8 hour shifts and on 12 tractors, 34 bottom dumps, one 2½-yard shovel and three 3½-yard shovels. While these costs were for specific equipment under the conditions of this one job, they nevertheless are significant. Many a contractor can report similar ratios.

### Human Element Unchanged

Equipment makers are working constantly to build more rugged and fool-proof machines, and costs for repairs undoubtedly are lower than in the old days. We have better lubricants, and all manner of special servicing equipment and techniques. The only thing that hasn't changed is that human beings still manage and operate and repair the equipment.

Repair and replacement costs can often be cut substantially, but it's up to the boss. The boss, whether he be a contractor principal, highway department maintenance or district engineer, or what, has two main problems:

First, he or a trusted aid must know equipment and be able to judge when repair costs are out of line, when it is time to replace a machine, when a part is

worth welding or hardfacing—and when a repair delay is too costly in job stoppage to tolerate. This kind of knowledge is the secret of many a contractor's profits right today.

Second, he's got to make sure the servicing routine is really being carried out. A memo of instructions is one thing. Seeing that oil changes, greasing, tire inspection, and correct repair procedures are being followed out is something else. Shop foremen, mechanics, helpers, operators all must follow through—and report back. A large New Jersey contractor's master mechanic out on the Turnpike last summer told us, "When a bearing burns out, the big boss (owner) personally traces down the history of the machine. If he finds that servicing was skimped or skipped anywhere, somebody gets fired." This extremely successful company is literally built around its equipment.

On this same turnpike project, another contractor according to the scuttlebutt "didn't believe in greasing 'em." And in a couple of highway department shops visited recently, this reporter detected a complacency and lack of concern over equipment maintenance. We wish these fellows luck. From here on they'll need it. Maybe the top boss in such cases will want to take a closer hand.

### Winter Standard Needed

More and more frequently the old problem arises as to what the public may expect as the standard condition of a road surface in winter. During the 1951-52 winter in New York State a judge awarded damages to a motorist because he wrecked his car when it had skidded on an icy spot of the road surface caused by freezing of melting snow. The plows had pushed the snow off the surface to give traffic an opportunity to use the road. The road had been cleared long enough for a dry surface to exist except where water from the melting snow had run across the surface. In the shade the wetness on the surface froze, creating a slippery spot.

It is not inconceivable that a stupid driver of a motor vehicle would so carelessly drive as to skid off the pavement on that slippery spot, nor is it inconceivable that he would sue the state. There are all kinds of people on the roads.

This situation is something like a man sticking a knife in your back after you had done him a good turn. Back in the late '20s and early '30s highway engineers, by discussions, agreed that snow removal should be handled by highway maintenance departments as a service to traffic and as a good public relations effort.



Not enough public relations capital, however, has been made out of the effort. The highway departments have done such an excellent job that motorists no longer hesitate, no matter what the weather, if they have to go somewhere. They have come to depend and to rely upon finding the roads clear even during a blizzard.

Having received this service the motorist callous enough to sue the state because of his own stupid driving should be given a lesson in gratitude.

This situation merely points up the problem, again, as to the limit of the highway department's responsibility. That limit could be specified only when there is legal recognition as to what the public may expect as the standard condition of a road surface in winter.

## Traffic Safety "Action Platform"

As we look ahead into the 1952 summer with its holiday week end traffic peaks, it is a good time to recall the recommendations which came out of the President's Traffic Safety Conference last June in Washington. The whole accident prevention problem in a nutshell—here is their official platform. Italics are ours.

1. All drivers charged with moving violations be required to appear in person in traffic courts.

2. Legislative action at all levels of government be instituted to increase strength of law enforcement agencies in those areas where it is now inadequate to do the job.

3. Police concentrate their efforts against those traffic violations which are causing accidents.

4. Motor vehicle administrators consider special examinations for drivers of tractor-trailer units and all bus drivers.

5. All states study their existing traffic laws and take steps to bring them into conformity with model state traffic legislation.

6. *Research be carried forward to develop needed facts on personal causes of accidents, and on engineering design responsibility for accidents.*

7. *The nation's streets and highways be brought as promptly as possible to a standard and condition consistent with the needs for safe and efficient transportation.*

8. Responsibility for school highway safety programs be vested in one person appointed by school officials.

9. Advertisers be requested to give serious consideration to wider use of television advertising in the promotion of highway safety.

10. The secretary of defense be requested to obtain and coordinate the recommendations of the Army, Navy, and Air Force with respect to a uniform policy on the handling of military violators of traffic laws and submit a suggested policy for cooperation with civilian authorities and traffic courts.

11. Colleges and universities be urged to expand their facilities for the training of technicians in highway engineering, police enforcement, traffic engineering, traffic courts, safety education, centralizing accident records and motor vehicle administration.

12. Traffic violators responsible for death by auto be sentenced to jail.

## Foreign Steel, One Answer

The Pennsylvania Department of Highways late in January was offered unlimited quantities of assorted types of steel products, without allocations, priorities or interference with U.S. Government allocations by a Pennsylvania import firm, E. L. Schmidt, Acting Secretary of Highways, announced.

The shipment offered contained steel plate at .0825 per pound FOB New York, New Orleans or Illinois. I-beams could be had at \$.0775 per pound FOB New York or Houston. Reinforcing bars were quoted at .0775 per pound FOB New York, Houston, New Orleans, Jacksonville or at west coast ports. Another 500 tons of additional steel, expected to arrive at New York in February, was also offered.

Pennsylvania needs upwards of 100,000 tons of steel for its estimated requirements in 1952. Allocations by the Defense Production Administration have been far less.

"It is a fantastic situation," Mr. Schmidt said of the foreign offer. "Importers will supply steel we are unable to get from our own Pennsylvania mills, which are producing record quantities. In Pittsburgh, heart of the steel industry, highway projects are being slowed down by lack of steel, which we could only get by importing from abroad."

This is an utterly absurd situation which should be corrected and speedily by the Federal authorities. The Pennsylvania department leaders rejected the foreign offer, possibly for their own reasons of political or economic ideology. It would indeed take a strong stomach for a patriotic American to be a party in importing steel which probably passes, in mid-ocean, other steel Washington is giving away abroad.

It could be hoped, however, that other state highway departments had a chance to snap up this foreign tonnage, despite personal bewilderment at Washington policies. We understand that departments can buy foreign steel without it being charged against their allotments, providing the steel is paid for beyond our 12-mile shore limit.

## Winter Safety Problem

Despite the use of flashing signals and 20-minute flares by cinderling crews, motorists are crashing into the rear of cinderling equipment in greater numbers than ever before, according to Fred E. Goodhart, Safety Engineer, Pennsylvania Department of Highways.

Three state maintenance men were killed and 12 seriously injured this past winter up to January 1. This total is more than double the number killed and injured by similar cause during the same period in 1950 in Pennsylvania.

"We are greatly concerned over the mounting accident toll," Mr. Goodhart said. "The flashing signals may be seen over ample distances. The flares give motorists additional warning that they will encounter a cinderling truck in their traffic lane within twenty minutes or less. Despite these safeguards the accident toll is greater than ever. It is sad and tragic that the men who are safeguarding the motorists are too often their victims. Our men are beginning to regard a cinderling assignment as a suicide mission."

News releases were sent out over the state explaining this situation, and urging an immediate reduction in speed when either flashing signal or flare is seen.

# Road Builders Consider Critical Highway Needs

OVER a thousand engineers, contractors, government officials, highway user group leaders, and manufacturer representatives attended the American Road Builders Association annual convention, held January 21-25 at Houston, Texas. In keeping with its historic role of spearheading national highway promotion, the ARBA on this 50th anniversary gathering divided time between an examination of highway needs and progress, and numerous technical subjects.

One billion dollars a year should be spent by the federal government in highway aid, instead of the present five hundred million, and even more than this sum is justified, delegates were told by Senator Dennis Chavez (Dem. N.Mex.) at the opening session. The Senator, who has introduced a bill (S-2437) for such a program into the present Congress, was one of several speakers who gave latest data on the growing obsolescence of the nation's roads, and on the economic benefits of bringing the system up to higher standard.

A. C. Clark, deputy commissioner, U.S. Bureau of Public Roads, reported that 72% of the primary, 62% of the secondary and 62% of the urban federal-aid system highways are substandard, with these figures climbing each year. About 43,000 miles of such roads are arriving annually at the worn out stage, yet only 19,279 miles of federal-aid projects were completed in 1951 or 45% of the mileage needed. This picture would be far worse, said Clark, if not for the fact that state, county and local organizations are using their own funds over and above funds for matching federal-aid, for construction projects, stop-gap improvements and extraordinary maintenance on their systems.

## Sufficiency Rating

The word "sufficiency" has leaped into the center of highway planning, and following the example of the Highway Research Board at its Washington meeting, the previous week, the ARBA convention leaders gave consideration to sufficiency rating as a tool of program planning and financing. Mr. Clark reported that all

routes on the three federal-aid systems (primary, secondary and urban) are being measured for their sufficiency (percentage of ideal for the traffic), with about 20% of the mileage thus analyzed to date. Of the roads rated, 75% are found to fall short of adequacy in some vital respect, i.e., they are too narrow, crooked, hilly, lacking in shoulder width, etc.

Expressways took the limelight in the Houston program, with an all-morning program on the subject and an inspection trip over the local Gulf Freeway. E. R. Needles, consulting engineer of New York City who presided at this session, observed that of all our highway problems, the one of providing expressways in urban areas takes first rank. Although requiring very large expenditures, he noted that to date there is almost no way of accurately forecasting the full importance of such facilities, by way of example he cited the Delaware River Memorial Bridge at the southern end of the New Jersey Turnpike. This bridge, replacing a ferry, was the subject of an advance study which indicated that probably 13,000 vehicles daily with 20,000 on peak days would pay the proposed toll, and perhaps the volume would rise to 30,000 later on. "We were so wrong," says Needles, since from 30,000 to 36,000 vehicles daily used the bridge last summer immediately after its opening, and be-

fore the connecting turnpike was completed.

## Turnpike Traffic High

The New Jersey Turnpike similarly has immediately carried traffic well in excess of predictions, with 59,590 vehicles passing the toll gates on Sunday January 20, the first week-end after the 118-mile pike was opened full length. "We as engineers cannot even come close in predicting the effect of expressway facilities on our great population centers and the economy of the country," said this authority.

D. C. Greer, state highway engineer of Texas, and W. J. Van London, engineer-manager, Houston Urban Expressways, spoke on urban expressway developments in the larger Texas cities, Mr. Greer pointing to the policy of building outward from the city's center when possible, as a means of providing maximum early benefits and getting the most painful part of the job done first. Expressways are well along in Houston, Dallas, San Antonio and Fort Worth, and projects planned for Austin and Beaumont. Mr. Van London described the success of the Gulf Freeway, a 5-mile section of which is now carrying 70,000 vehicles daily as against 52,000 predicted. The cost of this facility while high per mile (\$1,800,000) corresponds on a per-vehicle basis to that of a farm-to-market road costing \$12,000 per mile and carrying 300 vehicles per day. Even at \$5,000,000 per mile, a contemplated Houston project is expected to pay off definitely in economic benefits, said Van London.

Government cutbacks in steel allotments for highway construction were censured at the convention. A. E. Johnson of Arkansas criticized the position taken by some officials that "highway construction and replacement at this time are very non-



★ Paul B. Reinhold of Atlas Equipment Co., Pittsburgh, re-elected president of ARBA at Houston convention, with Eugene Reybold, executive vice president

essential." He stated: "They question the request of state highway departments for steel as being in excess of minimum requirements," and added that a similar attitude was taken by the Government during World War II. Deputy Commissioner Public Roads A. C. Clark noted that DPA has allotted 245,000 tons of carbon steel for highway construction during the second quarter of this year, compared to a request for 475,535 tons.

Steel for construction and road machinery manufacture is also to be tight during 1952, the delegates were told. C. J. Haring of J. D. Adams, who is representing the industry with NPA in Washington, reported that the 1952 second quarter allotment for civilian output of this industry will be cut back while military tonnage will be increased. Normally 30% of all construction equipment is sold for purely highway construction and maintenance use; this classification is to be sharply reduced. While some steel is allocated for parts, owners of equipment will be getting cast rather than forged parts in many cases, or else parts of a lower type alloy steel.

Panel discussions or papers were included on a variety of technical subjects, including farm-to-market roads, county and local problems, city streets, soil-cement, concrete paving, bituminous methods, calcium chloride stabilization, soils and compaction, maintenance costs, airport design, and the problem of truck loads.

During the Houston convention a new division of ARBA, the Materials and Supplies Division, was formed with George Kimber, president of the Calcium Chloride Association, as chairman.

A noteworthy development was the appearance of a special 16-page "Better Highways" section of the Houston Chronicle, carrying feature articles on the need for faster highway development and advertisements of automotive, petroleum, tire, and other manufacturers and suppliers identified with highway transportation.

### Paul Reinhold Again Heads ARBA

Paul B. Reinhold, President Atlas Equipment Corp., Pittsburgh, Pa., was re-elected to a second term as President of the American Road Builders Association at the Houston convention. Other officers and directors elected for 1952 are as follows:

Vice Presidents: Charles M. Noble, Chief Engineer, New Jersey Turnpike Authority, Trenton, N.J.; Charles W. Smith, President Smith Engineering & Construction Co., Pensacola, Fla.; M. J. Hoff.

(Continued on page 64)

## Highway Research Board Holds Diversified Program

OVER one hundred fifty technical papers and reports were presented at the Highway Research Board's 31st annual meeting, held January 15 to 18 in Washington. Fifty-five of the Board's departments and committees also met during the week, marking a continuation of the Board's expansion in breadth and volume of activities. Executive committee chairman Ralph A. Moyer in his address before a general session made special note of recent developments in cooperative research.

Under a procedure developed by the AASHTO committee on Research Activities, two or more state highway departments may unite on a research project, with or without use of the 1½% of Federal-aid funds available for research. The Board supervises these projects when desired, with AASHTO Executive Committee approval. Recent joint projects include:

(1) The Maryland concrete pavement traffic tests in which 11 states, the D. of C., 17 truck manufacturers, 14 petroleum companies and the U.S. Department of Defense cooperated.

(2) Study of effect of wind stresses on bridges, with 18 states, the D. of C. and the BPR cooperating.

(3) The Western Region Road Test for which design, construction plans and financing of a test road in southern Idaho have been completed.

A million-dollar cooperative test road project for the middle-west, requested by the Mississippi Valley ASHO, is in the hands of a task committee.

The Board also is supervising four other joint projects: the Non Rigid Pavement Design (Hybla Valley) project, Study of Intergovernmental Relationship in Highway Affairs (in Maryland), Calcium Chloride Soil Stabilization Project, and project involving a Study of Off-Street Parking and its Relationship to Business.

Chairman Moyer noted that these projects have brought together organizations of widely differing points of view but with a common interest in highway transportation, including motor clubs, trucking associations, manufacturers, the petroleum industry and highway engineers and officials.

Roy W. Crum, late director of the Highway Research Board, was post-



★ C. S. Mullen of Virginia, recipient of Bartlett award.

humously awarded the George S. Bartlett Award, and also the Highway Research Board Distinguished Service Award for his outstanding contribution to highway progress. The two awards were presented by Thomas H. MacDonald, Commissioner of Public Roads.

The Bartlett Award was also presented to C. S. Mullen, chief engineer, Virginia Department of Highways, for outstanding contribution to highway progress.

The Highway Research Board award, for the best paper on highway research published by the Board last year, was given to Thomas J. Carmichael, Detroit, administrative engineer, General Motors Proving Ground; and Charles E. Haley of Phoenix, Arizona, project engineer, Committee on Vehicle Characteristics. Their paper was a study of the statistical measurement of relationship between vehicle, roadway, and traffic conditions.

Numerous papers from the Board's 31st annual meeting are abstracted in "Highway Research Abstracts," Dec. 1951, issue, received by Board members and available at 30 cents a copy on request to the Highway Research Board, 2101 Construction Avenue, Wash. D.C.

*Facts and comments on a number of subjects treated at the recent Highway Research Board meeting will be published in succeeding issues of ROADS & STREETS.*



★ Platform and belt, set up successively at several locations along the job, was this contractor's unique solution to his pavement problem

## Truck Mixers Belt-Loaded for Pavement Repair Job

A TEN-MILE highway resurfacing job was largely completed during 1952 by the unusual method pictured here. The Ray F. Yount Company, contractors of Kittanning, Pennsylvania, hit on the idea, which was to supply the job from truck-mixers, loaded by belt at a succession of strategic roadside locations to cut haul distance and reduce the number of truck mixers needed. The job was on Route 422 in Armstrong County, Pa.

Over 4,000 sq. yd. of 9-in. resurfaced concrete pavement was used for widening the existing road 2 ft. on each side, and another 2,000 sq. yd. for repairing or replacing intermittent sections of existing pavement. The project also included considerable

yardages of crushed aggregate base course, and an over-all 2 1/4-in. bituminous surface.

The method here described proved logical for this contractor, who preferred not to move his batch plant to the job at the time. Also because of the relatively small quantity of portland cement concrete required along any one part of the 10-mile project. The distance from a central plant would have been too great for economy.

At designated points along the job, accessible from side roads, the contractor simply installed a portable platform, hopper and belt loader. Measured batches of aggregates were trucked to the location along with bagged cement. Water was supplied

from an approved nearby source. Proper mixing time in transit was accomplished readily during the rather short hauls required. Only two trucks of 8-yd. capacity were needed to keep the job moving.

### California Policy on Traffic Control Past The Job

In view of the growing tendency to include traffic control through road construction work as a pay item in the contractor's bid, contractors and highway department people will be interested in the California policy.

According to state maintenance engineer George Hellesoe, the state of California has the following policy:

(a) Those devices that are primarily intended to protect traffic from hazards arising as a result of the contractor's operations are installed and paid for by the contractor.

(b) The devices or procedures that are primarily intended for the direction, guidance, comfort and convenience of traffic are paid for by the State, preferably as an extra item.

Typical items under (a)-Public Safety, will include barricades, signs, lights, flagmen, etc., when placed to guard the public against damage. Traffic must be protected against damage from falling rocks, falling trees, slides, collision with equipment, open trenches or excavation, and a safe road must be maintained by the contractor during rough grading.

Typical items under (b)-Public Convenience, will include warning and direction signs, lights, flagmen, etc., that are primarily intended to guide and direct traffic at the beginning and end of a section under contract, and when flagmen and control cars are deemed necessary to expedite or convey traffic through the work.



★ Delivering concrete for a full-width pavement replacement section



# How Record Sized Girders

## Were Erected for Passaic River Turnpike Bridge

Field sections up to 178 ft. 3-9/16 in. long or weighing up to 176 tons required special methods of transporting, handling and setting. Closure of a record-length 375-ft. girder span in a 988-ft. 3-span continuous system was a feature of this job.

**L**ARGEST and most talked-of among the 253 bridges of the New Jersey Turnpike are the Passaic and Hackensack River bridges, located in the Jersey Meadows just outside New York City. Both structures are notable for their 375-ft. river span, constituting a U. S. record for girder span length. Both structures entailed difficult problems in fabricating, shipping, trucking, handling and erecting the numerous very long and heavy girder sections involved (see table).

Typifying the problems and in general the methods used on both projects are those here described for the Passaic River structure. This bridge, longest on the Turnpike, comprises 48 spans which support 6,947 ft. length of 6-lane-divided roadway. The substructure contract involving large tonnages of H-piles for foundations and heavy steel sheeting for open cofferdams, was executed by Geo. M. Brewster & Sons, Inc., with the exception of the two river piers, 1S and 1N, built by Underpinning and Foundation Co. The \$7,300,000 superstructure contract, held by Bethlehem Steel Company, was awarded early in 1950 and completed late in 1951.

### General Features Described

The Passaic River Bridge includes two lines of girders with cantilevered transverse floor girders. All but the five central spans are simply supported deck plate girders, ranging in span length from 76 to 176 ft. The central group at the river consists of a 3-span continuous system of 275', 375' and 275' span length, c. to c. piers, flanked on either side by a 220 ft. span. The latter spans are hinged to cantilevers from the main continuous girder system at points 31½ ft. behind the end piers, thus making a length of 988 ft. for the continuous girder system on four pier supports. Shoes at both ends of the central 375' span are "fixed" and the river piers

are designed to flex when steel shortens or lengthens due to temperature changes. This design, one of the outstanding features of the bridge, permits smaller river piers; and their smaller size made it possible to maintain the prescribed channel width between pier fenders without exceeding the over-all river span length of 375 ft. This span length is practically the limiting span for the single-web type of silicon steel girder used.

This unprecedented central system is made possible by the use of silicon steel for main girder lines. Silicon steel is also used in the main girders for the approach spans, as well as for some highly stressed details such as the tie plates connecting the floorbeam brackets to the center sections, the entire bridge requiring 7,150 tons of silicon steel and 14,000 tons of carbon structural steel.

Not only the central spans, but also numerous of the approach spans involved field sections of record or near-record length and/or weight, including the longest ever fabricated by Bethlehem. The longest of these sections shipped out as a unit measured 178' 3-9/16" end to end, and many others also taxed the railroad clearances and the capacity of trailer

equipment in transporting them to the site. The structural design was worked out in cooperation with the railroad to capitalize clearances and shipping facilities.

Steel was fabricated in the Pottstown and Rankin shops of Bethlehem. All but the river span steel was shipped via the DL&W. railroad to the foot of Broad Street, in Newark, where the steel was transferred by locomotive crane to special trailers and moved some four miles through the Newark streets and across a haul road in the tidal meadows to the erection site. Many of the girders required use of two, three and sometimes four rail flat cars. The loads skinned by the clearances by fractions of an inch.

### Shipping Problem

All of the approach girders are 10' 0½" back to back of angles and the shipping problem here was not complicated by the length or weight. The longest girder, 178' 3-9/16" and weighing 127 tons, was shipped on standard railroad cars and raised directly from the cars to its final position in the span over the Pennsylvania tracks. Some of the longer approach girders, however, had to be field spliced because of trucking difficulties (such as sharp curves and low bridges) between the point where girders arrived on the R.R. cars and the bridge site.

Cartage of all steel including reinforcing steel for the substructure and deck contracts for this bridge, was handled by Bigley Bros. trucking con-

★ Cutting out into the swampy Meadows toward the bridge







★ Hoisting closure girders for Passaic river bridge

tractors of New York. This firm moved 65,000 tons of material for the Passaic and adjoining Hackensack River bridges in a combined operation, unloading steel with a locomotive crane under a schedule more or less dictated by shop production and rail deliveries. Hauling went on day and night through the Newark streets, employing as many as 20 heavy truck-trailer units at a time on the two bridges.

This company's equipment consisted largely of Mack trucks and

Rogers trailers. All hauling of heavy girders was performed by means of a truck-trailer unit under each end, the rear unit facing backward. A "Jeep" trailer was often necessary between the truck and the flatbed. It is noteworthy that the largest loads utilized as many as 82 tires to distribute the weight and protect the street pavement.

Hauling in some cases continued without pause through week-ends in order to meet the Turnpike Authority's stiff schedules. Much credit is

given to Newark City and Hudson County police and other officials for cooperating. In one instance it was necessary to close a section of U. S. 1, one of the world's most heavily traveled truck routes, for a time and re-route traffic in order to transport a girder along the only possible route to the job.

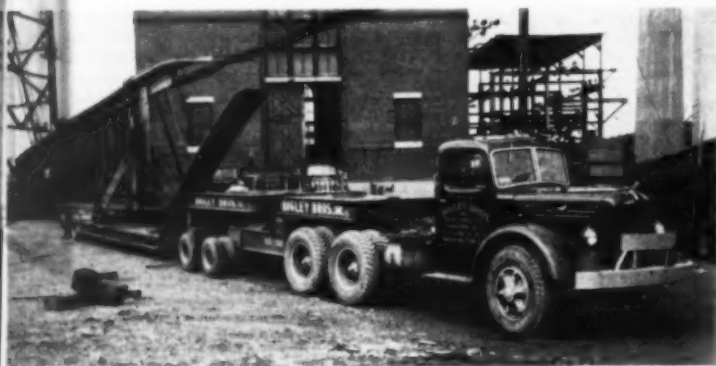
Transportation of field sections for the long-span central system was a special problem. This steel was moved by rail to a barge loading point, where cars were run onto a car float and towed to the bridge. Haunch girders at the river piers have a maximum depth of 21' 6 1/2" b. to b. of angles over the piers. This depth was such that a horizontal field splice was necessary, done on the cars while on the barge.

The continuous river span girders are 13' 3 1/2" back to back of angles, except at the haunches. The problem here was to keep within the overhead clearances on the railroads. To do this it was necessary to lower the girder by eliminating the railroad cars and shipping the girders on special trucks only, one at each end. The girder itself acted as a draw-bar between the trucks, and at each end there was a special draw-bar connected to a flat car.

### Big Travelers

Steel erection was performed by two travelers, working toward the river from either end by the usual cantilever method, using steel false-work bents where required. The travelers were 115-ton capacity American Hoist & Derrick stiffleg derricks with special sills mounted on a 39' x 90' engine platform specially built for this job. The two masts were located at the front end, one over each line of girders, and were spaced 39 ft. center to center with the sills at 90 degrees. Each derrick had a boom 115 ft. long with a 20 ft. jib and was swung by a 16 ft. diameter bullwheel. The engines powering the derricks were American Hoist & Derrick gasoline driven 3-drum units with swinger attachment and with a lead line pull of 20,000 lb. Each boom employed 21 parts of 1-in. wire rope in topping falls, and 16 parts of 3/4 in. wire rope in main falls.

Each boom set its line of girders except where weight was greater than 85 tons. One such location was at piers 1N and 1S, where the 176-ton



★ 42 tires at each end—count 'em! Showing how the heaviest of the girders were transported

★ Another big load traveling through the streets around Newark, where city and county police cooperated

haunch sections—heaviest although not longest units in the job—required teaming up of both traveler booms to lift each girder with a 10-ft. balance beam.

### Setting Closure Section

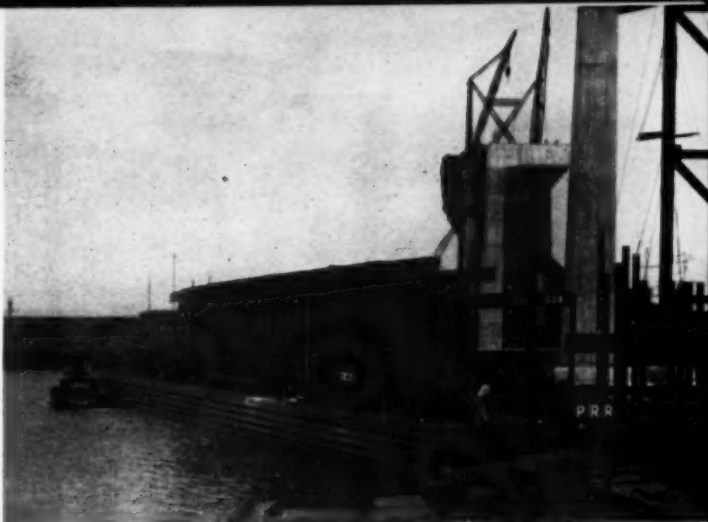
Another case was in hoisting and setting the closure sections midpoint in the 375-ft. river span. The two parallel 115½-ft. girder sections each weighing 146 tons were hoisted simultaneously from the barge by the four booms of the two travelers, each boom taking one end of a girder.

Closure of the river span was an interesting feature of the job. The procedures, based on painstaking advance calculations, called for close cooperation between the engineer's staff and the contractor's erection crew. It was necessary to calculate the top and bottom length, deflection and angularity of the cantilevered girder sections, and also of the closure section when suspended at corners during erection. Closure required manipulating the girder structure adjacent to the closure section, to provide the precise angularity and position necessary for the rivet holes to become fair and the splice to be connected. The closure span, upon completion, had to assume stresses and flexure as an integral part of the 3-span system; hence, the position and angularity of the adjacent structure was required to conform to office calculations within a small fraction of an inch.

A detailed, exact closure procedure was described in a mimeographed method sheet issued to all personnel concerned. This procedure evolved as a result of discussions between the erection department of the Bethlehem Steel Company and the Ammann & Whitney office.

The general procedure was as follows:

(1) The 18-in rollers were removed temporarily from piers 2S and 2N, and the girders lowered at these piers



★ Two closure girders framed together on a barge prior to hoisting into place

## Passaic River Bridge, New Jersey Turnpike

### Girders Erected

No. of Girders Approach Spans	Length e-o Bearings	Depth h-h Angles	Weight Each
2	75' 8"	10'0 1/4"	23 tons
2	160' 2"	do	100
14	111' 5"	do	43
2	157' 6"	do	98
1	173' 8"	do	125
1	139' 10"	do	78
1	108' 2"	do	47
1	142' 0"	do	78
2	150' 8"	do	87
2	140' 8"	do	76
6	142' 6"	do	77
4	158' 3"	do	98
1	147' 1"	do	83
1	168' 0"	do	118
1	178' 10"	do	127
1	150' 8"	do	86
14	133' 11"	do	71
14	182' 7"	do	69
4	118' 0"	do	46
10	100' 0"	do	35
2	91' 8"	do	29
1	88' 2"	12'6 1/2"	104
			Cross Girder }
River Spans			
4	133' 5"	Suspended Girders 10'0 1/4" to 11'10 1/4"	109 tons
4	54' 3"		39
4	116' 9"		116
4	125' 6"	do	118
4	129' 0"	Haunch Girders 13'3 1/2" to 21'6 1/2"	173
4	68' 0"		59
2	118' 0"	do	146

★ Showing the type of falsework bents used and also giving a view of the two-boomed traveler



★ Falsework bents in the River supported on a framed pile cluster for each foot as shown here





★ Closure girders being framed together and prepared for hoisting into place off the barge. Photo October 16, 1951

on plates, to permit the necessary rotation of the girders on piers 1S and 1N. Adjustment vertically was controlled by jacks at falsework bents adjacent to piers 2S and 2N.

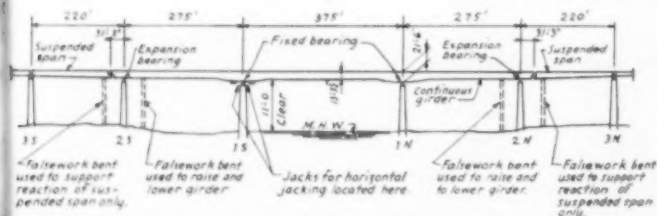
(2) Jacks at pier 1S were used to move the south girder line horizontally on the shoes toward the river, until, by a combination of (1) and

(2), closure position was effected.

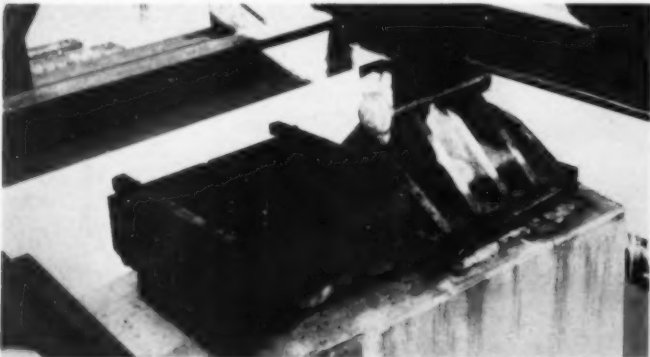
(3) Jacks at pier 1S were operated to move the pier top horizontally until the bolts connecting shoe to girder could be made at this pier.

(4) The permanent rollers were restored at piers 2S and 2N, by means of the falsework jacks.

Jacking at pier 1S was performed



★ Details of falsework bents and the central girder system



★ A roller nest was used under each girder line on Pier 2S during the final closure operation, which involved sliding girders longitudinally and adjusting elevation by means of hydraulic jacks at the adjacent falsework bent



★ Structural details of hinge located 31 1/2 ft. back of Pier 25

by pairs of 250-ton hydraulic jacks for each girder line, operated between the top shoe casting and a jacking bracket on the bottom of the girder cover plates (see sketch). A wooden platform across the pier top was used by workers in setting and operating the jacks. The horizontal movement of the girders was accomplished by sliding them on lubricated bearing plates on top of the shoes.

The Passaic River bridge was designed and its construction supervised by Ammann & Whitney, Consulting Engineers, as part of their work as Section Engineers (bridges) for Section 6 of the New Jersey Turnpike Authority. Milton Brumer was project manager, Werner Ammann, project engineer and Royton F. Wheadon, resident engineer. Erection by Bethlehem Steel Company was under the direction of Geo. P. Adair, erection manager for the firm's New York district. Charles M. Noble is chief engineer for the New Jersey Turnpike Authority.

### Texas to "Load Zone" Farm-Market Roads

The Texas Highway Department has announced a program of "load zoning" of farm-to-market and ranch-to-market roads throughout the state, in accordance with a new state law. This law raised the over-all maximum gross weight highway vehicle limit in the state to 58,420 lb., but made an exception by giving the Highway Commission the power and authority to fix maximum gross weights below this amount on farm and ranch-to-market roads where conditions justify.

# Settlement Analysis

## For High Fills on Compressible Foundation Soils

*It is suggested that the reader go over this article first for a general understanding and then again for detail understanding. The article is well written and all of the words work. The author is well qualified on this subject.—Editor.*

**By R. L. Sloane**

Associate Professor of Civil Engineering  
University of Utah, Salt Lake City, Utah

AMONG the many problems confronting the highway engineer in the design and construction of the modern superhighway is the problem of estimating the settlement of high approach fills for overpasses or bridges, due to consolidation of soft subsoils upon which the fills may rest. The overpass or bridge structure itself is usually supported upon pile foundations under these circumstances and lends itself to another type of analysis.

A settlement analysis for the fill will furnish the design engineer with information on the total probable amount of settlement and a prediction of the time required for completion of the settlement. With this information at hand the engineer can intelligently make decisions on possible increase of fill quantities required, and upon special provisions for hastening the settlement by increasing the rate of consolidation through overloading the fill, vertical sand drains in the subsoil, or by pumping from well points in the subsoil.

The consequences of fill settlement after completion of the pavement and structure are: displacement and cracking of the pavement producing a very difficult maintenance problem, particularly if the settlement is great; and conceivably a displacement of the abutments of the structure which might seriously affect its safety.

The mechanics of the consolidation process are fairly well known for the one-dimensional case and have been worked out in theory by Dr. Karl Terzaghi<sup>1</sup>. Briefly the theory depends upon six major assumptions:

1. Homogeneous soil,

2. One-dimensional compression of the soil,
3. One-dimensional flow of the pore water during the squeezing-out process,
4. Complete saturation of the soil,
5. Validity of Darcy's Law of flow of water through soils,
6. Constant values for certain soil properties which may be variable, and an idealized pressure-void ratio relation.

Variation of actual cases from these assumptions will lead to some inaccuracy in the prediction of settlement and time-settlement relations<sup>2</sup>. A consideration of the assumptions leads to the conclusion that, given a reasonably uniform soil below the water table subjected to essentially vertical loads where water will be squeezed out of the soil during consolidation in a vertical direction only (either up or down, or both), the theory should give reasonably good results. At least good enough results that the engineer may make his decisions with reasonable certainty.

The analysis presented here is a modification of the method used for foundations of structures and is patterned after that presented by Dr. D. W. Taylor in his excellent work on *Soil Mechanics*<sup>3</sup>. This method was used by the writer for time-settlement prediction on a number of approach fills and traffic interchanges while working in the Materials Laboratory of the Utah State Road Commission during the Summer of 1951. The example given below is based upon one of these analyses.

### Example Demonstrates Method

Essentially, the analysis consists of three distinct parts. The first part consists in determining the soil profile

and the properties of the soils encountered at the site. The second part consists of the analysis of subsurface pressures within the compressible layer or layers induced by the weight of the overlying soil and the weight of the fill. The third part consists in making use of one-dimensional consolidation theory and data from the first two parts to give the final settlement results.

It is essential to an accurate analysis that the soil survey be carefully and adequately conducted and that sufficient representative samples, undisturbed if possible, of the various soils at various depths be obtained. [Samples deeper than necessary are more economical than samples not deep enough.—Editor.] Where no firm underlying soils are found in the survey it may be necessary to sample to a considerable depth, sometimes as deep as 150 ft., inasmuch as surface loads imposed by fills of even moderate height will still cause appreciable consolidating pressures within the soil at this extreme depth.

It is the function of the laboratory to run classification and consolidation tests on the soils obtained in the survey. For use in this type of analysis, the results of the consolidation tests should be presented in the form shown in Figure 2.<sup>4</sup> In addition, it is desirable to know certain other soil properties such as the unit weight of the soil in place and the specific gravity of the soil particles. The unit weight of the compacted fill material must be known also or at least an estimate made.

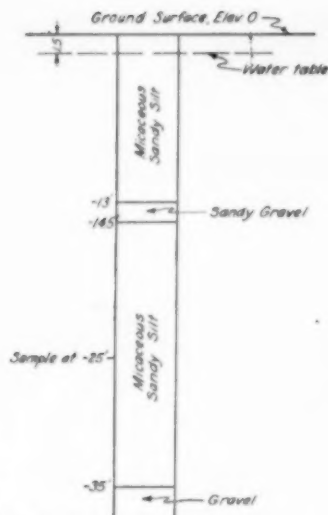
The second and third parts of the analysis can be presented best by considering a typical problem and following the complete analysis through.

Figure 1 shows the soil profile for

<sup>1</sup>Terzaghi, K. *Erdbebenmechanik auf bodenphysikalischer Grundlage*, Sec. 20. Leipzig: Deuticke, 1925.

<sup>2</sup>Taylor, D. W. *Fundamentals of Soil Mechanics*. New York: John Wiley and Sons, Inc., 1948.

<sup>4</sup>An excellent method of test and presentation of results is detailed in Lambe, T. Wm. *Soil Testing for Engineers*. New York: John Wiley and Sons, Inc., 1951.



★ Figure 1

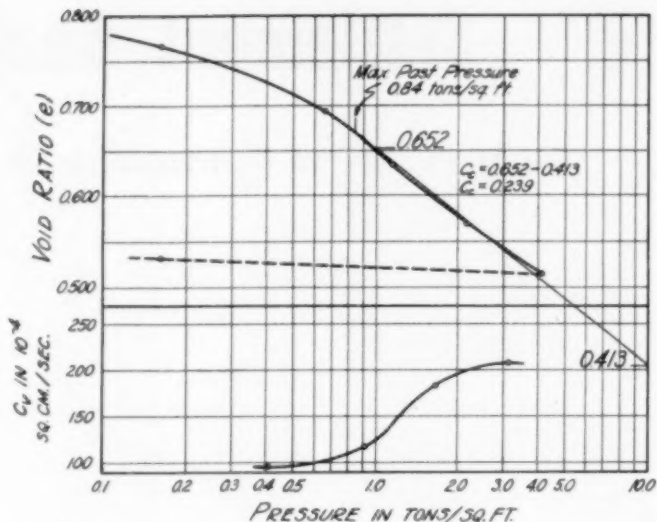
the problem. Two soft compressible layers of micaceous sandy silt, separated by a sandy gravel stratum 1.5 ft. thick, with the bottom layer resting upon a thick gravel stratum comprise the system. The existing water table is 1.5 ft. below the surface. The soil above the water table is partially saturated and assumed to be subject to the same degree of consolidation as the remainder of the first layer. Hence there are two layers, one 13.0 ft. thick and the other 20.5 ft. thick, subject to consolidation by loads applied to the surface. Notice that each layer will permit escape of water from both top and bottom of the layer during consolidation due to the presence of pervious material above and below each layer. Following usual practice it is assumed that the first few lifts of the fill will be composed of granular pervious material.

The consolidation characteristics of the micaceous sandy silt, obtained by consolidation tests in the laboratory, are shown in Figure 2.

A simple laboratory test reveals that the specific gravity of the soil particles is 2.72. However, due to the softness of the soil and the location of the water table, no reliable figure for the unit weight of the soil in place is available. A trial method of determining the submerged saturated unit weight of the soil, based upon the pressure-void ratio curve (Figure 2.) and the specific gravity, can be used to gain a fairly accurate estimate of this quality.

#### Calculation of Submerged Unit Weight ( $\gamma_b$ )

Assume  $\gamma_b = 60$  lb./cu. ft.



★ Figure 2

Then pressure at  $-35$  ft.  $= 35 \times 60/2000 = 1.05$  tons/sq. ft.

From the "p - e" curve (Fig. 2) for  $p = 1.05$  tons/sq. ft.,  $e = 0.643$ .

$$\gamma_b = \frac{G - I}{1 + e} \gamma_w = \frac{2.72 - 1}{1 + 0.643} \times 62.4 = 65.3 \text{ lb./cu. ft.}$$

Therefore, assume  $\gamma_b = 66.0$  lb./cu. ft.

Then pressure at  $-35$  ft.  $= 35 \times 66/2000 = 1.15$  tons/sq. ft.

From Figure 2 for  $p = 1.15$  tons/sq. ft.,  $e = 0.634$ .

$$\gamma_b = \frac{G - I}{1 + e} \gamma_w = \frac{2.72 - 1}{1 + 0.634} \times 62.4 = 65.7 \text{ lb./cu. ft.}$$

This is sufficiently close, therefore 66.0 lb./cu. ft. will be used for the saturated submerged unit weight. Inter-granular pressures at the various depths may be computed directly

by using the submerged unit weight of the soil provided that neither residual hydrostatic excess pressure in the pore water nor an artesian condition exist. Inter-granular pressures and not total pressures must be used in the analysis because pore water pressures forming a part of the total pressures cannot cause consolidation in the soil mass. Proceeding on the assumption that the simple static case exists (no residual hydrostatic pressure or artesian pressure) the soil pressures within the soil before surface loading are computed as follows.

#### Calculation of Soil Pressures before Surface Loading

Vertical soil pressures must be computed at the top, mid-depth, and bottom of each compressible layer in order to arrive at a weighted average for each layer. A unit weight of 125

#### Soil Pressure Before Surface Loading

Depth in Ft.	Intergranular Pressure in Tons/sq. ft.
At 0	0.000
At -1.5	$125 \times 1.5/2000 = 0.094$
-1.5 to -6.5	$66 \times 5.0/2000 = 0.165$
At -6.5	0.259
-6.5 to -13.0	$66 \times 6.5/2000 = 0.215$
At -13.0	0.474
-13.0 to -14.5	$66 \times 1.5/2000 = 0.050$
At -14.5	0.524
-14.5 to -24.75	$66 \times 10.25/2000 = 0.338$
At -24.75	0.862
-24.75 to -35.0	$66 \times 10.25/2000 = 0.338$
At -35.0	1.200



lb./cu. ft. is assumed for the partially saturated soil between the surface and -1.5 ft. depth.

### Determination of Pre-Loading Pressure Condition

An examination of the pressure-void ratio ( $p$ - $e$ ) curve, Figure 2, shows that the maximum pressure to which the soil has been subjected in the past was 0.84 tons/sq. ft.\* The sample was taken at -25.0 ft. depth and the intergranular pressure at -24.75 ft. depth, from the table above, has been computed to be 0.862 tons/sq. ft. There is little discrepancy between these two figures for essentially the same depth thus indicating that there is no residual hydrostatic excess pressure or artesian pressures within the soil to reduce the intergranular pressure below the computed value. Therefore, the simple static case apparently holds.

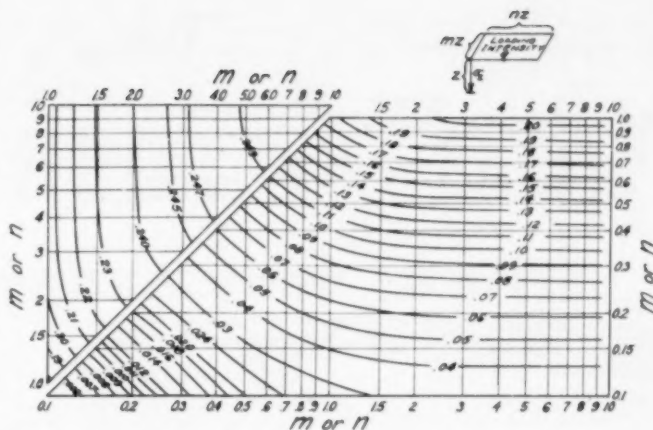
The increases in pressure within the soil due to the addition of the fill may now be computed.

### Calculation of Pressure Increases Due to Fill

Laboratory compaction data show that the fill material will have a compacted unit weight of 125 lb./cu. ft. The cross-section of the fill is as shown by the solid lines in Figure 3. For ease in pressure calculation assume the fill to be squared off as shown by the dashed lines.

Pressures within the soft layers due to the weight of the fill may be computed by elastic theory. For area loading the commonest ways are to make use of the Newmark equations for elastic material or the Westergaard formulas for material reinforced laterally. Both have been plotted as a series of curves giving influence values for various ratios of the dimensions of the area to the depth at which the pressure is desired. Figure 4 below shows the Newmark curves which will be used in this example. Had the consolidating layers been stratified material, the corresponding Westergaard curves would be more nearly applicable.

In using the Newmark Chart, the pressure at the desired depth ( $p_z$ ) is equal to the product of the unit sur-



★ Fig. 4

face load ( $q$ ) and a function of the factors "m" and "n." These factors are simply the ratios of the dimensions of the loaded area to the depth ( $z$ ) below the surface at which pressures are desired. The curves in the chart give the values of the functions of "m" and "n." It should be noted that the pressure, thus computed, is the pressure at depth ( $z$ ) below one corner of the loaded area, therefore to compute pressures below the center of a loaded area it is necessary to consider the area split up into four rectangular areas as in Figure 5.

From inspection of the Newmark Chart it appears that the function of "m" and "n" will be nearly constant if either "m" or "n" exceeds 2.0. Since the width of the loaded area is fixed as shown in Figure 3, and the maximum depth to which pressures are desired is 35 feet, the length of fill to use in the analysis must be four times this depth or 140 feet. A length of 140 ft. will insure that either "m" or "n" will always be equal to or greater than 2.0. Figure 5 shows the length of fill for which pressures within the soil due to the weight of the

### Calculation of Pressure Increases

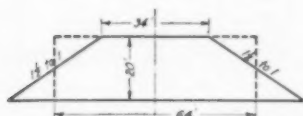
Depth	"m"	"n"	$F(m, n)^*$	Vertical Pressure
0	—	—	—	$20 \times 125/2000 = 1.250$ tons/sq. ft.
-6.5	32 = 4.9	70 = 10.8	0.249	$4 \times 1.25 \times 0.249 = 1.245$
-13.0	32 = 2.95	70 = 5.4	0.246	$4 \times 1.25 \times 0.246 = 1.230$
-14.5	32 = 2.2	70 = 4.83	0.241	$4 \times 1.25 \times 0.241 = 1.205$
-24.75	32 = 1.29	70 = 2.83	0.220	$4 \times 1.25 \times 0.220 = 1.100$
-35.0	32 = 0.91	70 = 2.0	0.192	$4 \times 1.25 \times 0.192 = 0.960$

\*Values obtained from Figure 4 for indicated values of "m" and "n."

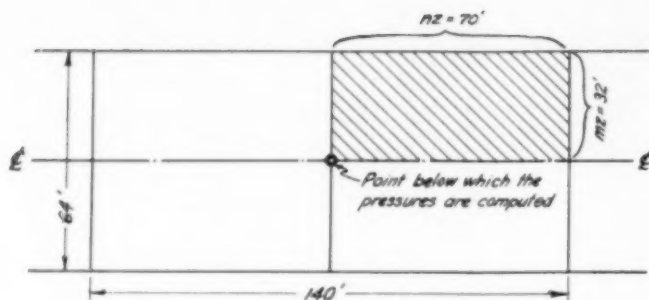
### Tabulation of Final Effective Pressure

Depth	0	-6.5	-13	Av.*	-14.5	-24.75	-35	Av.*
Pressure due to overburden ( $p_1$ )	0.000	0.259	0.474	0.252	0.524	0.862	1.200	0.862
Pressure increase due to fill ( $\Delta p$ )	1.250	1.245	1.230	1.243	1.205	1.100	0.960	1.094
Total Pressure $p_z = (p_1 + \Delta p)$				1.495				1.956
Av. Pressure acting in soil				0.874				1.409

\*Averages for  $p_1$  and  $\Delta p$  computed by Simpson's Rule.



★ Figure 3



Note: Pressures below the indicated point will be equal to 4 times the pressure induced by the shaded area.

★ Fig. 5

fill will be computed.

With the final effective pressures computed it is now possible to compute the total amount of settlement.

#### Estimate of Total Amount of Settlement

The total settlement will be estimated by both the void ratio method and the Compression Index method inasmuch as the first of these methods sometimes proves sensitive to small changes in the void ratio when the  $p - e$  curve is relatively flat.

##### (a) Void Ratio Method.

$$\text{Ultimate Settlement} = \frac{2H_1}{1 + e_1} (e_1 - e_2)$$

Where  $H_1$  = length of longest vertical drainage path  
 $e_1$  and  $e_2$  = void ratio before and after loading

For layer between 0 and -13 ft.,  $2H_1 = 13$  ft. ( $H_1$  here is only the half-depth of the layer because pore water may be squeezed out of the layer through both top and bottom.) From the Tabulation of Final Effective Pressures and Figure 2:

for  $p_1 = 0.252$  tons/sq. ft.,  $e_1 = 0.748$   
 for  $p_2 = 1.495$  tons/sq. ft.,  $e_2 = 0.605$

$$\text{Ultimate Settlement} = \frac{13}{1 + 0.748}$$

(0.748 - 0.605)

Ultimate Settlement = 1.06 ft.

For layer between -14.5 and 35.0 ft.,  $2H_1 = 20.5$  ft.

From the Tabulation of Effective Pressures and Figure 2:

for  $p_1 = 0.862$  tons/sq. ft.,  $e_1 = 0.665$   
 for  $p_2 = 1.956$  tons/sq. ft.,  $e_2 = 0.578$

$$\text{Ultimate Settlement} = \frac{20.5}{1 + 0.665}$$

(0.665 - 0.578)

Ultimate Settlement = 1.07 ft.

Therefore, Total Ultimate Settlement = 1.06 + 1.07 = 2.13 ft.

##### (b) Compression Index Method.

The numerical value of the slope of the  $p - e$  curve is defined as the Com-

pression Index and its value may be obtained from Figure 2. For the case under consideration there is no pre-compression and therefore the slope of the essentially straight-line portion of the curve is desired. The slope is the void ratio change per logarithmic cycle and is equal to 0.239 for this example.

Ultimate Settlement =

$$\frac{2H_1}{1 + e_1} \times \frac{(p_2 - p_1)}{1/2(p_2 + p_1)} \times 0.435 C_c$$

For layer between 0 and -13 ft.,  $C_c = 0.239$ .

$p_1 = 0.252$ ,  $p_2 = 1.495$ ,  $e_1 = 0.748$ ,  $2H_1 = 13$  ft.

Ultimate Settlement =

$$\frac{13}{1 + 0.748} \times \frac{(1.495 - 0.252)}{1/2(1.495 + 0.252)} \times 0.435 \times 0.239$$

Ultimate Settlement = 1.10 ft.

For layer between -14.5 and -35.0 ft.,  $C_c = 0.239$ .

$p_1 = 0.862$ ,  $p_2 = 1.956$ ,  $e_1 = 0.665$ ,  $2H_1 = 20.5$  ft.

Ultimate Settlement =

$$\frac{20.5}{1 + 0.665} \times \frac{(1.956 - 0.862)}{1/2(1.956 + 0.862)} \times 0.435 \times 0.239$$

Ultimate Settlement = 1.00 ft.

Therefore, Total Ultimate Settlement = 1.10 + 1.00 = 2.10 ft.

This shows close agreement between the two methods. For the remainder of the analysis the following values for the ultimate settlements will be used: for layer between 0 and -13.0 ft., 1.1 ft.; for layer between -14.5 and -35.0 ft., 1.0 ft.

#### Time-Settlement Prediction

There remains only the calculation of time of settlement to complete the analysis. Time of settlement is given by the following relation:

$$t = T \times \frac{H^2}{c_v}$$

Where:  $H$  is the length of the longest vertical drainage path

$c_v$  is the coefficient of consolidation for the average pressure acting within the layer

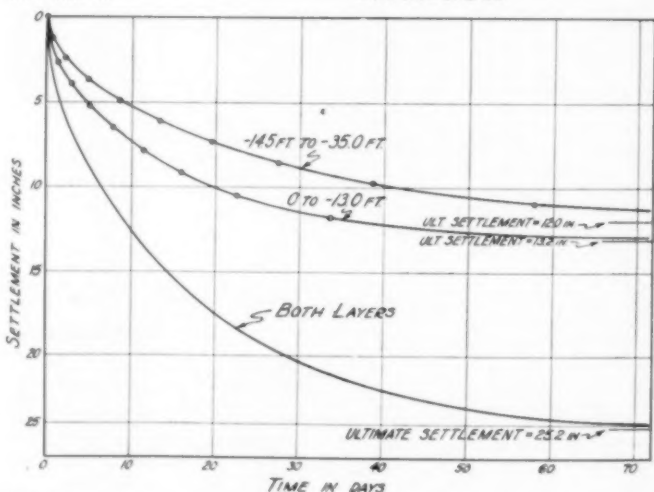
$T$  is a dimensionless time factor

Because our values of  $H$  are in feet and our values of  $c_v$  are in sq. cm./sec. the expression for time of settlement in years will become:

$$t_{\text{years}} = T \times \frac{(H \times 30.5)^2}{c_v \times 31.5 \times 10^6}$$

For the layer between 0 and -13.0 ft.:

$2H_1 = 13.0$  ft.,  $H_1 = 6.5$  ft. From Figure 2 for  $p_{av} = 0.874$  tons/sq. ft.  $c_v = 0.0114$  sq. cm./sec. Settlement = 1.1 ft. = 13.2 in.



★ Fig. 6

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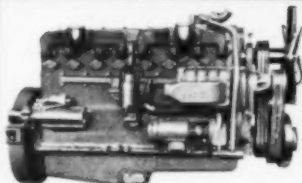
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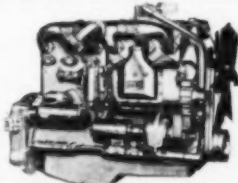
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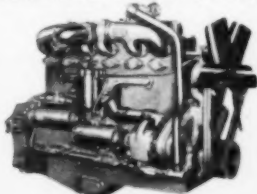
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### Settlement Data, Layers 0 ft. to 13 ft.

Settlement (inches)	% Consol.	$T$	$t$ (years)	$t$ (days)
1.3	10	0.008	0.0009	0.3
2.6	20	0.031	0.0034	1.2
4.0	30	0.071	0.0077	2.8
5.3	40	0.126	0.0137	5.0
6.6	50	0.197	0.0215	7.8
7.9	60	0.287	0.0313	11.4
9.2	70	0.403	0.0438	16.0
10.5	80	0.567	0.0618	22.6
11.9	90	0.848	0.0924	33.7

### Settlement Data, Layers 14.5 ft. to 35 ft.

Settlement (inches)	% Consol.	$T$	$t$ (years)	$t$ (days)
1.2	10	0.008	0.0015	0.5
2.4	20	0.031	0.0058	2.1
3.6	30	0.071	0.0133	4.8
4.8	40	0.126	0.0236	8.6
6.0	50	0.197	0.0368	13.4
7.2	60	0.287	0.0536	19.6
8.4	70	0.403	0.0754	27.5
9.6	80	0.567	0.1060	38.7
10.8	90	0.848	0.1585	57.8

$$t_{\text{cons}} = T \times \frac{(6.5 \times 30.5)^2}{0.0114 \times 31.5 \times 10^6}$$

$$t_{\text{cons}} = 0.109 T$$

$$t_{\text{cons}} = 0.109 T$$

Values of the time factor ( $T$ ) have been computed and are given in the table for the various percentages of consolidation.

For the layer between -14.5 and -35.0 ft.:

$2H_i = 20.5$  ft.,  $H_i = 10.25$  ft. From Figure 2 for  $p_{\text{av}} = 1.409$  tons/sq. ft.  $c_v = 0.0166$  sq. cm./sec. Settlement = 1.0 ft. = 12.0 in.

$$t_{\text{cons}} = T \times \frac{(10.25 \times 30.5)^2}{0.0166 \times 31.5 \times 10^6}$$

$$t_{\text{cons}} = 0.187 T$$

Figure 6 shows the settlement as a function of time for each of the consolidating layers. The total time-settlement curve was obtained by adding the ordinates of both the individual layer curves.

### Discussion of Results

The results, in this example, show a total ultimate settlement of slightly over two feet which will be essentially completed in something over sixty days.

The amount of settlement indicates that it would be well to figure an additional two feet of fill materials into the quantities required and to build the fill approximately two feet higher than the final height so that upon completion of settlement a minimum of grading need be done to prepare the fill for paving.

The time of settlement is unusually short, which might have been suspected from the fact that the consolidating material is a sandy silt and hence will permit pore water to

squeeze out rapidly under the weight of the fill. However, the time indicates that the greater portion of the consolidation will occur during the construction of the fill and the attendant structure. Therefore, no special provisions need be made to hasten the consolidation process nor is there need to prolong construction of the project for more than one construction season in order to allow the fill to completely settle.

Had the time of settlement been a number of years instead of months, as computed, it would have been well to consider the possibility of installing vertical sand drains or well point pumping to hasten the consolidation and thus cut down the time required for construction and utilization of the fill and overpass structure. Overloading of the fill might also have been considered for the same purpose.

### Load Carrying Capacity Vs. Frost Action

Highway Research Bulletin No. 40 includes a progress report of the Committee on Load-Carrying Capacity of Roads as Affected by Frost Action and a paper on, "The Effect of Temperature on the Bearing Value of Frozen Soils." The committee report, compiled by Chairman C. L. Motl, is a supplement to the previous reports published by the Board in 1948 and 1949. The additional data collected definitely indicate that strength of all types of soil is affected adversely by freezing and thawing action. Included are reports from state highway departments of Iowa, Michigan, Minnesota, New York, North Dakota, and Ohio.

For copy, address Highway Research Board, 2101 Constitution Ave., Washington 25, D.C.

### Graceful Wing Walls for Small Bridge

An unusually attractive treatment for wing walls of a small highway bridge is pictured in the accompanying photograph. This structure was designed and built by the Ohio Department of Highways. It is located on State Route 668 in Perry County.

The bridge consists of a single 40 ft. clear span supporting a 28 foot wide roadway. It crosses a stillway channel in a conservancy dam, and the appearance factor was given especial attention because of the conspicuous location in this recreational area. The project was in co-operation with the Ohio Division of Conservation. Photo supplied by C. V. Farrar, field engineer with the Ohio Department of Highways.



★ Graceful wing walls, built on a radius and vertically marked, are a feature of this small bridge in Ohio



## Sound advice about **TRUCK POWER**

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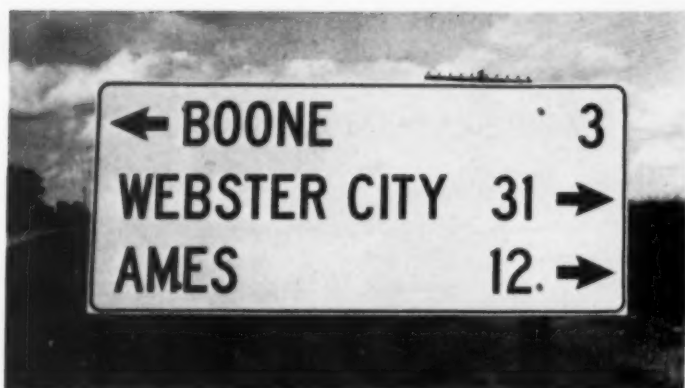
life, and year-'round dependability. Consider, for example, such extra values as stellite-faced, sodium-cooled exhaust valves . . . surface-hardened bearing journals . . . intake valve and exhaust valve seat inserts . . . and others!

Add to all this the fact that there's a Dodge "Job-Rated" truck that's factory-engineered to fit your job and your power needs to a "T"!

So . . . why not get a truck that's designed especially to take sweat and strain *out* of your toughest jobs and put extra profits in. Get a Dodge "Job-Rated" truck! See your nearby Dodge dealer—*soon*.

# **DODGE "Job-Rated" TRUCKS**





★ Not over three city names to a panel, is one fundamental of sign design observed in Iowa's program



★ A big stop sign can be seen farther back, giving driver time to slow down

## "Oversize" is Word for New Iowa Traffic Signs

THE Iowa State Highway Commission has erected oversize highway markers at 110 major highway intersections throughout the State. The signs are similar to those described in the manual on Uniform Traffic Control Devices but are somewhat larger. All signs have a white reflectorized coating with black letters except the "stop ahead" signs, which have a yellow reflectorized coating with black letters.

All signs were purchased on contract from maintenance funds at a total cost for signs of \$21,326. They were mounted on 4" x 4" treated timber posts 10 to 14 ft. long with the lowest portion of the sign assembly a minimum of 3 feet above the roadway shoulder.

The reaction of the traveling public to the oversize signs is reported very

favorable. The State expects to continue with the program at other intersections, according to an observer in the Bureau of Public Roads.

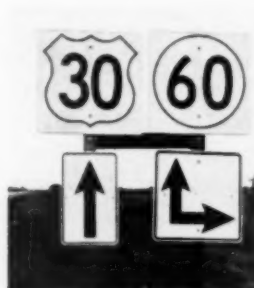
The following tabulation shows the number and type of sign purchased, size of sign and letters and cost:

D. W. Burch, safety engineer of the

commission, reports that in addition to the tabulated items, some 300 stop signs 30" x 30" with reflector coating background have been purchased; also some 36" x 36" with buttons for intersections.

Failure of the City of New York to keep a Bronx street in good repair resulted recently in an award of \$100,000 damages to a construction worker. He suffered injuries when his employer's truck struck a hole in the pavement. His employer, the John Paoline Construction Company of Lindenhurst, Long Island, agreed to pay \$20,000 of the award, according to a news item.

Design	Description	Sign	Size Letters	Number Purchased	Cost Each	Total Cost
M 42	Junction	32"x16"	12"	363	\$5.09	\$ 1,847.67
M 12	Numbered Sign-US	28"x28"	10" to 14"	1,802	6.93	12,487.86
M 22	Numbered Sign-State	28"x28"	12" to 14"			
X 1	Blank for Repl. of	28"x28"		100	2.15	215.00
	M 12 & M 22					
W 71	Stop Ahead	30"x30"		400	7.55	3,020.00
M 52	Advance Turn Right	24"x24"		105	4.95	519.75
M 62	Advance Turn Left	24"x24"		105	4.95	519.75
M 82	Straight Ahead Arrow	24"x15"		500	3.15	1,575.00
M 92	Double arrow	30"x15"		200	3.80	760.00
M 102	Two direction arrow	24"x24"		77	4.95	381.15
					Total	\$21,326.18



★ Some of the oversize route sign arrangements which have won approval of Iowa road users

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★ Culvert shown immediately after being rolled off skids on far bank

## 1,500-Foot Culvert Pipes Rolled in With Cranes

**A**N unusual culvert was specified recently by the Corps of Engineers in solving the problem of extending a runway over a creek at McChord Air Force Base, Tacoma, Washington.

The drainage solution here consisted of diverting Clover Creek from its regular channel, excavating a new channel and then placing twin corrugated steel sectional plate culverts, each 12 ft. in diameter and 1,500 ft. long, into the new channel to handle the flow. The completed culverts are

10 ft. under the pavement of the runway extension.

The huge culverts were fabricated on wooden skids alongside the new channel. In a coordinated action, each 1,500-ft. pipe was rolled into the channel by four cranes working in unison on the opposite bank.

Ends of each pipe were sealed by bulkheads to keep it afloat until permanently positioned. Bracing timber struts placed inside the pipe protected it during the maneuver. A bulldozer

nudged the pipe into alignment.

After the culverts were placed in position, cranes began burying them. Tractor-drawn scrapers were used to complete the backfill.

The two tubes are designed to discharge 500 cu. ft. of water per second without increasing the backwater.

### Texas Plans 400 Miles of Low-Steel Projects

During January the Texas Highway Department took bids on 400 miles of road work for which no project required no more than 10 tons of scarce critical projects such as structural steel. This work included 270 miles of farm roads, 91 miles of state financed highway betterment projects, and 79 miles of main or primary highways.



★ Beginning of backfilling operations. Right view shows struts and bulkheading of pipes (pipes not in final position)



You need **EVERY** Feature  
for most effective Snow and Ice Control !

- ✓ **100% Traction** in four driving wheels. No spinning wheels, no slipping, no stalling.
- ✓ **High Speed Plowing** to throw snow far off road, leaving less to re-handle.
- ✓ **Great Power** for severe conditions and drifts.
- ✓ **Positive Control of Direction** in plowing, widening and levelling.
- ✓ **Easy Maneuverability** in tight spots, narrow roads.
- ✓ **High Capacity Plows and Wings** to remove greater volume.
- ✓ **Extreme Ruggedness** to stand up for years.
- ✓ **Handle All Winter Conditions** of snow, sleet, ice.

**Only WALTER SNOW FIGHTERS  
provide them ALL !**

**Y**OU are missing most of these vital features by not using Walter Snow Fighters to clear your roads faster, handle severest emergencies, keep traffic moving safely and cut down your winter maintenance costs.

Remember—Walter Snow Fighters are the only equipment designed and built especially for snow and ice control. They have engineering features found in no other equipment. For example, Four-Point Positive Drive to provide 100% traction in four driving wheels; automatic lock and torque proportioning differentials to prevent wheel-spinning; tractor type transmission for rugged service; suspended double reduction drive for greater gear capacity and higher ground clearance; short wheelbase; proper weight distribution; and many others. Get the complete story from your distributor—or write us for literature.

WALTER MOTOR TRUCK CO., 1001-19 Irving Ave., Ridgewood, 27, Queens, L. I., N. Y.



**WALTER**

4-POINT POSITIVE DRIVE  
**SNOW FIGHTERS**

—the lowest cost snow removal equipment because they  
remove more snow—clear more miles—serve more years

## Reclaiming coal



Rupp Brothers, Incorporated, general contractor of Kittanning, Pennsylvania, use one of their five MICHIGAN Truck Excavators to reclaim coal for the Powell Coal Company. Coal formerly lost by diverting coal washings into rivers and streams is now pumped into settling pits and reclaimed by the mine. Rupp Brothers use this 1/2-yard MICHIGAN clamshell to spread the still wet coal dust over high ground for drying.

Says operator Ken Rupp: "MICHIGANS are tops with me. They're fast and easy to maintain. I especially like the air controls". States A. L. Rupp, president: "Our MICHIGANS require very, very little maintenance. They're always available so we get contracts others can't handle because their equipment is tied up for repairs".



Make your next excavator-crane a MICHIGAN . . . you, too, will be 'way ahead. Send for details.

# MICHIGAN POWER SHOVEL COMPANY

480 Second Street, Benton Harbor, Michigan, U.S.A.

(Continued from page 47)

man, Minnesota Commissioner of Highways, St. Paul, Minn.; A. Diefendorf, Head, Department of Civil Engineering, University of Utah, Salt Lake City, Utah.

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Directors (1955 Term): Paul Andrews, Executive Secretary, Georgia Highway Contractors' Association, Atlanta, Ga.; Bernard E. Gray, President, The Asphalt Institute, New York, N. Y.; T. B. Hale, Vice-President, International Harvester Co., Chicago, Ill.; J. E. McCracken, Sales Engineer, Bethlehem Steel Co., Bethlehem, Pa.; Robert M. Reindollar, Consulting Engineer, Baltimore, Md.; Paul B. Rynning, County Engineer, Jackson County, Medford, Oregon; Charles H. Sells, Consulting Engineer, New York, N. Y.

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Kent County, Mich.

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Director (for 3 years): W. E. Greene, Barber-Greene Co.; Chauncey B. Smythe, Thew Shovel Co.; J. W. Lloyd, Ohio Oil Co.; J. G. Miller, Baker Manufacturing Co.; Ralph K. Stiles, Austin-Western Co.; Boyd S. Oberlink, Allis-Chalmers Mfg. Co.; Robery J. Ritchey, U. S. Steel Co.

### 1951 Boom Year for Penn Turnpike

A record-breaking \$14 million was collected in revenue from 7½ million vehicles using the Pennsylvania Turnpike System during 1951, according to Thomas J. Evans, chairman of the turnpike commission.

The toll increase, stimulated by the 100-mile eastern (Philadelphia) extension, were 54.9% over 1950. The extension increased the mile length of the system by 63.2%, while system traffic volume for the year was up 66.3%. Vehicles on the newly-opened 67-mile Western Extension averaged 6,600 daily the first week, Dec. 26-31.

The peak month in 1951 was August, when drivers of 934,000 vehicles paid over 1½ million dollars in tolls. Biggest single day was Saturday, September 1, when \$70,777.67 was collected.

### Utah Road Conference March 3-5

The thirteenth annual Utah Highway Conference and Road Show will be held March 3, 4 and 5 at the Coliseum, Utah State Fair Grounds, Salt Lake City. The Conference is sponsored by the Civil Engineering Department of the University of Utah, under Professor A. Diefendorf.

Speakers will include F. Salditt, vice-president, Koehring Co. (also president, Construction Industry Machinery Assn.); Ralph Stiles, executive vice-president, Austin-Western Co.; V. J. Brown, Gillette Publishing Company; and unannounced speakers representing the U. S. Bureau of Public Roads, Utah State Highway Department, Portland Cement Association, Asphalt Institute and several western highway departments. Banquet speaker will be William Hazlett Upson, author of the "Earthworm" tractor stories. Contractor's day is March 4.

# GET A FREE Tuffy SLING AND PROVE TO YOURSELF IT'S MORE FLEXIBLE!

Yes, here's your chance to see for yourself the braided wire fabric of which TUFFY Slings are made. Tie it in knots, kink it—then see how easily a Tuffy sling can be straightened out without material damage.



Patent No. 2,454,417

### HOW Tuffy SLINGS ARE MADE

Scores of wires are stranded into nine parts, then machine woven into an interlaced wire fabric. This braided fabric gives extra safety and enduring strength. Even cutting one of the 9 parts does not result in stranding of the sling.

### 11 TYPES—PROOF TESTED FOR SAFETY

There are 11 different types of Tuffy Slings, each one proof-tested to twice its safe working load. And the safe working load is plainly marked on metal tags on each sling. Also, Union Wire Rope engineers will help work out special sling problems. If you have your own rigging loft, Tuffy braided wire fabric is available by the reel.

### FREE SAMPLE—MAIL COUPON

To show you the difference between TUFFY Braided Wire Slings and ordinary wire rope slings, we have made up a quantity of 3-foot slings. We want you to have one so that you can test it and prove to yourself that TUFFY Slings really are better. Mail the coupon below today for yours.



More scrap means more steel  
turn yours in today!

### UNION WIRE ROPE CORPORATION

Specialists in Wire Rope, Braided Wire Fabric and High Carbon Wire  
2200 Manchester Ave. Kansas City 3, Mo.

Gentlemen: Please have my Union Wire Rope fieldman deliver me a FREE Tuffy Sling.

Name

Address

City  Zone  State

Firm Name

for the ... **Complete**  
**QUALITY LINE**  
*depend on*  
**CARVER**  
**PUMPS**



Model KN1 1/2 L  
 4000 G.P.H.

**A COMPLETE LINE**

Carver Self-Priming Pumps available in all sizes from 4,000 to 240,000 G.P.H. Gas, Diesel, Motor or Belt Drive. Also Diaphragm Pumps up to 6,000 G.P.H. Ask for Bulletin No. 110. Carver Pump Co., 1056 Hershey Ave., Muscatine, Iowa.



**REPLACEABLE LINERS  
 AND IMPELLERS**

Sturdy, wear-resistant replaceable liners and impellers are standard equipment in all Carver Contractor Pumps. When wear eventually occurs you don't replace the entire costly casing, as in ordinary pumps. Simply remove and install a new liner, a new impeller if necessary, and new pump efficiency is restored at nominal cost.

Another Carver Quality Feature!

Quality is our strong forte—Every Carver Contractor Pump is designed and manufactured with one specific purpose in mind—to provide you with rugged dependable equipment, loaded with reserve power and stamina, to handle the toughest construction jobs. Nothing fragile about these pumps; no skimping on materials; no underpowering; no compromise of quality. Throughout their many years Carver pumps have earned an enviable reputation in the field for dependable, efficient and long-life service. We shall continue to build pumps that will perpetuate this reputation.

**Specify Carver Contractor Pumps—  
 your best buy for better performance.**

**CARVER**  
**PUMPS**

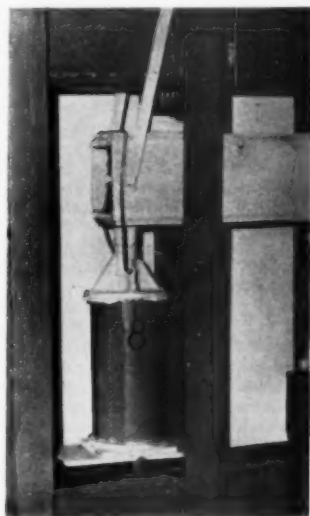
**Navy Engineers Build  
 Concrete Testing Machine  
 from Scrap**

An example of improvising equipment needed in a hurry is the small concrete testing machine pictured here. It was made from scrap and borrowed materials, as reported in the CEC bulletin of the Navy Civil Engineer Corps.

Designed for use in connection with a Navy wharf project, it was improvised for testing to determine whether 3,000-psi. concrete for piles and deck structure was being made up to specifications. In assembling this equipment a 20-ton hydraulic jack was obtained from a battalion transportation shop. A 5,000-psi. hydraulic aircraft gage was donated by another Navy unit. A squadron machine shop turned out the universal head, bearing plates, and pivots. Steel plates and channels for the frame were taken from a scrap pile.

To make use of the 5,000-psi. gage, a 4 to 1 lever system was devised to develop enough pressure to break 6-by 12-in. concrete cylinders. Pressure to break the test cylinders is transferred from the hydraulic jack by means of a box-section beam pivoted at the jack and fulcrum by pins, and at the bearing point by a ball-and-socket head. Another pin joint below the cylinder bearing allows for lateral motion of the fulcrum action. The gage measures the pressure in the pump cylinder, from which the pressure on the concrete is calculated.

Pressure on the test cylinder was only approximate in absence of cali-



★ Improvised concrete testing machine

bration. Friction losses in application of load caused some variations. However, a working relationship has been established by comparison of breaking values. More accurate tests could be made with a 50,000 psi. gage.

### Knee Bracing on Old Bridge Removed to Give Better Clearance

Many bridges on the Iowa primary system are high trusses with 20-foot roadway and maximum vertical clearance of 14 ft. Because of the knee bracing on the portals and intermediate sway frames, however, the 14-foot vertical clearance is available only along the central 14-ft. width of roadway.

To reduce the hazard by providing 14 ft. vertical clearance over the full width of roadway, the portal knee braces were removed and replaced in a horizontal position. The knee braces on the intermediate sway frames were adjusted so that the lower connections to the posts were high enough to give 14-ft. vertical clearance.

All replacements and adjustments were made by welding. The work on a total of 103 bridges was contracted by the Iowa State Highway Commission at a total cost of \$68,790.

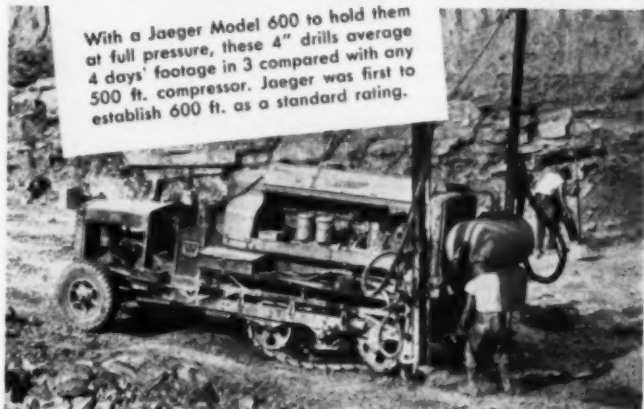


★ Knee bracing such as shown here often reduces clearance



★ Bracing has been eliminated by structural changes made to this Iowa bridge

## 40% more footage with JAEGER air-plus pressure

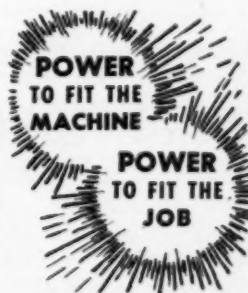


With a Jaeger Model 600 to hold them at full pressure, these 4" drills average 4 days' footage in 3 compared with any 500 ft. compressor. Jaeger was first to establish 600 ft. as a standard rating.

Want to cut costs? See your Jaeger distributor or get Catalog JC-1

4 days' work in 3 is possible on many jobs where Jaeger's increased "new standard" ratings step up the speed and hitting power of air tools. A Jaeger 75 will efficiently run one heavy breaker. A Model 125 will run two. Jaeger's 185, 250 and 365 ft. models deliver 25 to 50 cfm more air than "old standard" compressors to run larger tools at full efficiency.

**THE JAEGER MACHINE COMPANY** 223 Dublin Avenue  
Columbus 16, Ohio  
PUMPS • MIXERS • TRUCK MIXERS • PAVING SPREADERS and FINISHERS



## WISCONSIN-POWERED KWIK-MIX DANDIE MIXER!

Fast charging and discharge, rapid re-mixing plus high strength steel at key stress points are just a few of the features of the Kwik-Mix Company Mixer . . . another unit powered by a Wisconsin Heavy-Duty Air-Cooled Engine. No machine is better than its power, which is why Wisconsin Engines predominate. And these superior points are behind their far ahead performance. The crankshaft always rides easily and trouble-free, supported by tapered roller bearings at both ends . . . no danger of bearing failure. Cooling, too, is best, summer and winter, when you depend on air alone. And the OUTSIDE magneto, with impulse coupling, offers you more than easy servicing . . . you get quick starts and steady running always, rain or shine, cold weather or hot.

Write for details about all 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 30 hp.



### WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines  
MILWAUKEE 46 WISCONSIN



★ Applying a stream of water at high pressure to strip mud from a tractor

### Precast Bridges

"Recent Developments in Precasting Concrete Bridges and Structures," Bulletin No. 39, Highway Research Board. This research paper was presented to the thirtieth annual meeting of the board in January, 1951, by R. B. McMinn, senior highway bridge engineer, U.S. Bureau of Public Roads, Portland, Oregon, and was sponsored

by the board's committee on bridges.

The report discusses recent rapid advances in the use of precast members for building construction and the considerable interest exhibited in applying precasting to bridges and highway structures. One system of precasting combines precast stringers with cast-in-place slabs to form T-beam spans. The second system con-

sists of assembling precast beams and precast slabs and cementing together these structural members. Mention is made of developments in prestressing precast units.

Advantages in working with precast members reported: (1) savings in forms, falsework, and placing of concrete; (2) elimination of considerable on-the-job labor; (3) speeding up of construction; (4) facilitation of maintenance of traffic; (5) closer control of concrete mixture, placing, and curing; and (6) expedition of construction through precasting under cover during the winter season.

### Cleaning Tracks With High Pressure Nozzle

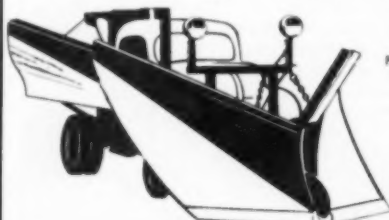
It is surprising what a little extra pressure on a hose will do on speeding up the cleaning of tractor tracks and other equipment gear. Pictured here is a hydraulic car washing outfit available commercially (Curtis). Using ordinary cold water from the city main, this equipment which operates at pressures up to 300 psi, will thoroughly clean a large tractor or similar machine in 2 to 3 hours at considerable saving over other methods often seen in use.

## CUT PLOWING COST UP TO 20% WITH FRINK V-TYPE SNO-PLOW!

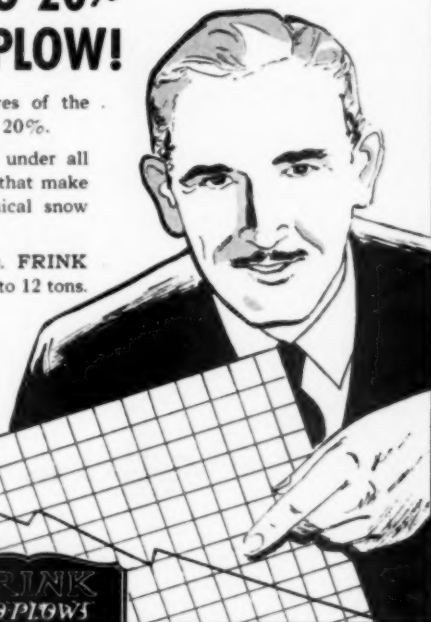
Highway departments have proven the special features of the FRINK V-TYPE SNO-PLOW save plowing costs up to 20%.

The Frink's many exclusive features have been tested under all snow conditions, in major snow areas, and the 18 plows that make up the FRINK line provide faster and more economical snow removal.

Write for information regarding the FRINK features. FRINK PLOWS are available for trucks with capacities from 1½ to 12 tons.



For Further Information  
Write Box R515  
Clayton, N. Y.



FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK  
DAVENPORT-BESLER CORP., DAVENPORT, IOWA  
FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

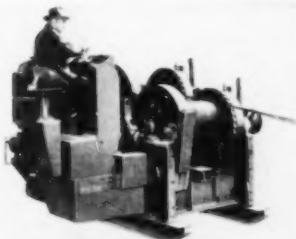
FRINK  
SNO PLOWS



## Equipment and Materials for Engineers and Contractors

### Steel Erection Hoist

A new hoist, announced by American Hoist & Derrick Co., is designed specifically for steel erection and features specified by steel erectors and hoist engineers. The hoist through a torque converter, anti-friction bearings, and air operated, contracting type tandem band clutches permit an operator to "feel" his load into position accurately and smoothly. Brake linkage between foot pedals and contracting bands is anti-



Iron Workers Special

friction bearing mounted for easy operation. Safety features include a back-up brake that engages automatically on reversal of the drive shaft, ratchet rings of forged steel with compression type dogs and overload regulating air valves which permit clutch slippage in case loads become "snagged" or "hung up" while being hoisted.

Three models are available: Model SE 140 with 14,000 lb. single line pull. Model SE 180, with 18,000 lb. single line pull and Model SE 250 with 25,000 lb. single line pull. American Hoist & Derrick Co., St. Paul 1, Minn.

### Power Tamp for Concrete

A new power tamp for tamping concrete, brought out by Gar-Bro Manufacturing Co., is designed for simple, one-man operation. It has an automatic clutch and governor controlled speed



Gar-Bro Power Tamp

Ever wonder why you *never* see a scowling, fagged operator on the Baker, A-C team? Here's why:



They just plain love that "doze-in-your-armchair" ease of control; that positive hold without throttle jockeying; that fraction-of-an-inch accuracy . . . that quick, direct lift; that positive down-pressure which puts almost all the tractor weight on the cutting edge; and the "roll-action" of the blade which leaves more tractor power for push. Because "Easy DOZE It!"



That's why you see the Baker, A-C team more and more wherever dirt has to be moved fast and efficiently. When operators *prefer* it, you can count on it being the best money-maker.



Specify Baker Bulldozers, Gradebuilders or Root Rippers for your new A-C Tractors . . . Baker makes engine-mounted hydraulic control models and cable-control models for the entire line of Allis-Chalmers crawlers. See your Baker, A-C Dealer. THE BAKER MANUFACTURING COMPANY, Springfield, Illinois.



P.S.: Baker is the PIONEER and the SPECIALIST in bulldozers



adjustable from 500 to 1500 tamps per minute. All bearing surfaces are fully protected from mortar and dust. Two quart capacity gasoline tank enables continuous operation for four hours without refueling. Float is of abrasion resistant moly steel. Gar-Bro. Manufacturing Co., 2415 E. Washington Blvd., Los Angeles 21, Calif.

#### "Form-A-Jig" Compound

A new plastic cement compound, "Form-A-Jig," which will not deform, move, or swell during welding operations as it holds the component parts together has been announced by Eutectic Welding Alloys Corporation. This new product is claimed by the manufacturer to be a swift, simple, inexpensive substitute for

a metal jig, ideal for assembling small lots where there is no time for elaborate jig construction. "Form-A-Jig" compound not only holds parts for welding, brazing and soldering, but may also be used to hold broken sections together for tool salvage and similar maintenance; for shielding or protecting from flame at any time; for working with heat treated or enameled sections; or as a mold for low-melting metals such as babbitt, solder, lead, aluminum, etc. Eutectic Welding Alloys Corporation, 172nd St. and Northern Blvd., Flushing, N. Y.

#### Splicing Conveyor Belting

A new method of splicing steel cable conveyor belting, developed and patented by the B. F. Goodrich Co., places all ca-

bles under equal tension during vulcanization so that each cable carries its share of the load in the finished splice. The new method also permits the straightest possible splice, resulting in belts that track straight and true for economical, trouble-free operation. Laboratory stress-strain tests prove that the splice is as strong as anywhere else in the belt. The tensioned splice can be made in the field as well as at the factory. Only special tools needed are a crimping device for squeezing the connectors to anchor the cable ends, and a special scraping tool to remove rubber from the cables. The B. F. Goodrich Co., Akron, O.

#### Convertible Masonry Saw

A new "convertible" Model HD Masonry saw, which is actually both a wet saw (dustless) and a dry saw, announced by Clipper Manufacturing Co., can be converted to both a concrete and track saw. At any time the cutting head of the Model HD masonry saw can be placed on the "Convertible" (4 wheeled) cart. The equipment is then ready for sawing concrete or asphalt patches or trenches. Through such a conversion it



Clipper "Convertible" Concrete Saw

is possible to switch from sawing glazed tile, concrete block, and fire brick to sewer, water or gas lines and floor patches in a matter of minutes. Fractures from jack hammer operations are now confined within the sawed removal lines plus the elimination of spalling. By placing this "Convertible" cart on tracks, a fourth use is accomplished. Stone slabs, Transite sheets, pre-cast stone, large refractories, plywood and masonite can be placed under the elevated tracks and sawed with this "Convertible" track saw. Clipper Manufacturing Co., Suite 749, 2800 Warwick, Kansas City 8, Mo.

#### Water Stop for Concrete Dams

A new water stop made of Geon polyvinyl plastic, a product of B. F. Goodrich Chemical Co., Cleveland, Ohio, is being used at the Guaybo Hydroelectric Project, now under construction in El Salvador, Central America. The water stop is stated to be much easier to install than types previously used in dam construction. It is made of vinyl plastic to provide superior aging characteristics, extreme resistance to the chemical action of concrete and resistance to temperature changes that occur when concrete is poured and sets up. The plastic joint seal, made by Perflex Plastics, Inc.,

# UNIT TV \*

**UNIT 1520  
Mobile Crane**

Capacity  
Up to 20 Tons

*\*Terrific Value...*  
**IN EVERY CHANNEL OF OPERATION!**

Here is another UNIT Star with an enviable record of performance on materials handling jobs everywhere. It's a self-propelled Mobile Crane that rides on rubber and is so easy to handle — the ULTIMATE in modern, high-speed mobile equipment. Mounted on 12 pneumatic tires, with duals on both steering axles and tandem rear axles. An air-operated transmission provides four travel speeds in either direction with a range up to 13 M.P.H. Rugged, heavy duty construction and balanced weight distribution assure maximum stability. Get the facts. Write for Catalog No. 502.



#### Send for a UNIT "TV SET"

You'll like this novel UNIT brochure. It portrays the complete UNIT line and illustrates the 10 reasons why UNIT is a better machine. Write for your copy today. There's no obligation.

**UNIT CRANE & SHOVEL CORP.**  
4407 West Burnham Street  
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SMBELTS • DRAGLINES • CLAMSHHELLS • CRANES • TRENCHERS • MAGNETS

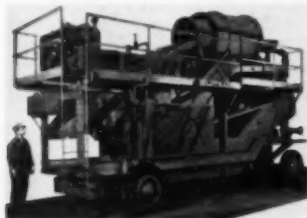
#### Select Your Favorite UNIT Star

- ★ UNIT 357 Mobile Type  
1/2 Yard Excavator  
Crane up to 9 tons.
  - ★ UNIT 414 Crawler Type  
1/2 Yard Excavator  
Crane up to 8 tons.
  - ★ UNIT 1020 Crawler Type  
3/4 Yard Excavator  
Crane up to 10 tons.
  - ★ UNIT 1520 Mobile Type  
1/2 Yard Excavator  
Crane up to 20 tons.
  - ★ UNIT 1014 Truck Crane  
1/2 Yard Excavator  
Crane up to 12 tons.
  - ★ UNIT 1320T Truck Crane  
3/4 Yard Excavator  
Crane up to 20 tons.
- All Models Convertible  
to ALL Attachments.

4344 S. Wentworth Ave., Chicago, Illinois, is a central rib backed by U-shaped grooves and weighs 2.02 lb. per foot. The finished seal is rolled into 100 ft. strips which are cut to desired lengths by a saw or knife at the construction location. A typical pour at the Guayabo project is a horizontal block 50 ft. square and 5 ft. thick. Joining or welding the thermoplastic vinyl strips is done at the installation site by merely applying sufficient heat to the loose ends with an electrically heated knife or gasoline torch, thus eliminating waste of short pieces. For construction joints where large shrinkage is expected, a seal strip of different design using the same principle is being developed. However, a government bureau has tested the present strip and found it is satisfactory for shrinkage openings up to  $\frac{1}{2}$  in.

#### Portable Washing Plant

A new Wash-More portable washing plant, developed by Lippmann Engineering Works, embodies all of the advantages of the previous Wash-More plant with the addition of a catwalk for complete access to all parts of the machine for easier and more productive

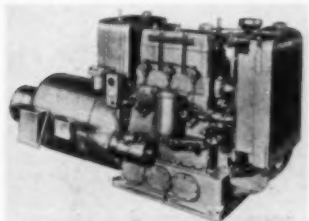


New Wash-More Portable Washing Plant

operations. This plant also utilizes mesh type screen guards to supplant the previous solid heavier type and additional strength has been given throughout the plant for even more rugged wear. The capacity of this plant is stated to run as high as 80 cu. yds. per hour and is completely portable for mobile operations. Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

#### Diesel Engine

Addition of a new, three cylinder diesel engine, conservatively rated at 30 to 45 hp within a speed range of 1200 to 1800 rpm, has been announced by Nordberg Manufacturing Co. This new engine, known as the 4FS3. It has a  $4\frac{1}{2}$  in. bore and  $5\frac{1}{4}$  in. stroke and is a four-cycle, vertical, mechanical injection diesel engine. Built as a complete, self-contained, ready to operate unit, it is available as an electric generator set, pumping unit and with clutch or stub shaft power take-off for direct connec-



Nordberg 4FS3 Diesel Generating Unit

# HERE'S WHY

## HERCULES FLATTENED STRAND IS 10% STRONGER

**It Packs More Steel Than  
Any Other Construction**

SEE the keystone shape of the strands? Notice how compactly they fit together? That's the answer. There is more steel and less fiber in HERCULES Flattened Strand than in any other wire rope construction of equal size. And if you specify wire rope core, you get still more strength—7½% more—in the same diameter. That extra strength is often mighty useful—safer, too.

SEE how smoothly it fits the sheaves? Not one—but four wires in each strand touch the groove. That gives longer life to the rope... longer life to the sheave, too, because Flattened Strand's smooth outer surface prevents corrugation. And it's Preformed for easy handling.

The Red Strand is always your assurance of wire rope made of the finest steel and to the highest standards LESCHEN has developed in 95 years of rope making.

**HERCULES RED STRAND**  
**TOUGH ROPE FOR ROUGH JOBS**

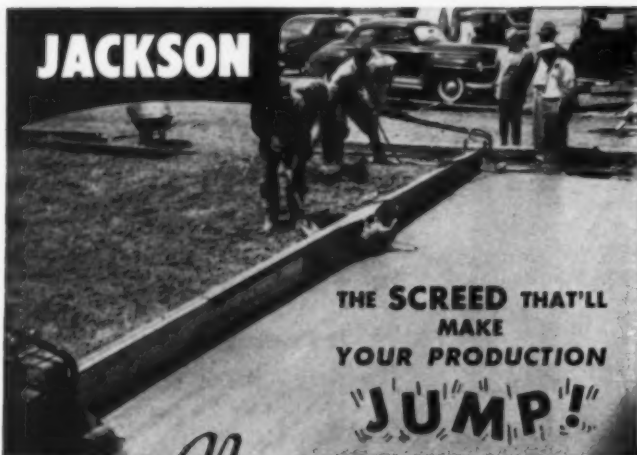
#### "Wire Rope Handbook"

tells why, and where Flattened Strand can best fit into your particular operation. Write for Booklet Q-2.



# LESCHEN WIRE ROPE

Consult our Engineering Department for specific recommendations. A. LESCHEN & SONS ROPE CO., 3909 Kennerly Ave., St. Louis 12, Missouri. Distributors in all principal cities.



THE SCREED THAT'LL  
MAKE  
YOUR PRODUCTION

**"JUMP!"**

Nothing compares with it for convenience, thoroughness and productivity on municipal concrete paving, highway widening, bridge-decks and similar jobs. It strikes off to any crown, undercuts at curb or sideform, works up to and around all obstructions. Permits pouring slabs up to 30' without center joint. Requires only two men on widest slab and is the only screed that can be rolled back for second passes on 4 rollers. Powered by Jackson 1.25 KVA Power Plant. Get the jump on competition. For Rent or Sale at your Jackson distributor. Details on request.

### AND FOR A *Revolutionary* MEANS OF COMPACTING ASPHALT . . .

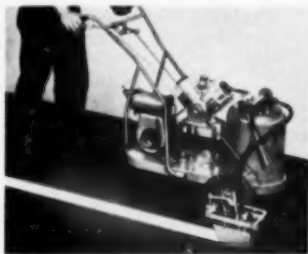
. . . in highway patching or widening, walks, drives, railway platforms and street crossings, etc. . . . investigate the new Jackson Vibratory Compactor. It delivers up to 4500 1½-ton blows per minute; propels itself and will compact 900 to 1200 sq. ft. per hour close to maximum density of asphaltic mix used. Easy to move from one location to another by means of quick pick-up trailer unit on which Power Plant is mounted. Also ideal for granular soil compaction. For Rent or Sale at your Jackson distributor. Details on request.



tion or belt drive. The Nordberg 4FSS generator set is completely equipped and is delivered ready to connect to load. It is available in direct or alternating current models from 20-30 kw in all standard voltages, 50 or 60 cycle. Built with side suction, two ball bearing pumps, with statically and dynamically balanced impellers, the Nordberg 4FSS pumping unit has a capacity of 500 to 3000 gpm at 20 to 220 ft. head. Nordberg Manufacturing Co., Milwaukee 7, Wis.

### Point Guide for Line Marking

A new flexible paint guide which enables the Econo-Liner line marker to paint sharp, clear lines on rough surfaces has been specially developed by the Universal Manufacturing and Sales Co. This guide permits the machine to follow the



Liner with Paint Guide

contour of the surface when painting on concrete, wood block, black top or brick. It is stated that the Mark-Rite Econo-Liner will put down approximately 10,000 feet of line per hour. With the adjustable spring-loaded shields it will paint any width line from 2 to 6 in., marks as close as ¼ in. alongside fixed objects. Universal Manufacturing and Sales Co., 8716 Santa Fe Ave., South Gate, Calif.

### Pneumatic Stake Driver

The Pneumadriver, a new attachment for the Scramm Pneumatractor is claimed to drive steel or wooden fence posts in 1/10th the time required by the old hand method. The Pneumadriver is a 7 ft. air feed with a paving breaker, mounting on a Pneumatractor. The paving breaker is fitted with a steel head shaped to fit the stakes or posts that are to be driven. The illustration shows one of these units in operation on the New Jersey Turnpike. Originally, the contractor had to use crews of five to fifteen men to hand drive the "U" stakes and the "T" stakes on their respective



Scramm Pneuma-driver on New Jersey Turnpike Work

jobs. The original estimate of the contractor for driving the stakes by hand was 4 stakes per hour, per man. With the aid of a Schramm Pneumadriller he was able to drive over 350 stakes per day with a two man crew, despite the traffic interruptions and interference from other construction work that was being done on the Turnpike. Schramm Inc., West Chester, Pa.

### Pipe Layouts Simplified

Using only four readings from a center line, pipe layout is simplified and time saved with new, accurate computers having pointers made of stable Vinylite plastic rigid sheet. The computer (top picture) gives direct readings for any angle of bend up to 126 degrees, in steps of one degree or less, on pipe diameters from one to 20 in. Complete angles of two pieces or multi-piece bends, y-layouts, etc., are read on the computer and transferred quickly to the



Computer (Top) and Circle Divider

actual pipe, sheet metal, templet or drawing board. This instrument gives distances in inches along the pipe from a vertical center line. Only four measurement readings are required to mark a pipe (by quadrants) at 16 different ordinate points on the circumference. The circle divider (bottom picture) gives instant reading of circumference divisions from  $\frac{1}{2}$  to  $1\frac{1}{16}$  in fractions of an inch for any circle up to 72 in. in diameter. This divider is handy for getting ordinate spaces for templet layouts. Both instruments are available in folding type for field use and flat type for the shop. Both measure 12 in. square flat; 12 by  $4\frac{1}{2}$  in. folded. Interstate Sales Company, 123 East 18 St., New York 3, N.Y.

### Concrete Cutter

To insure maximum diamond wheel life even on rugged concrete cutting operations, Felker Manufacturing Co., has increased power on their DI-MET heavy duty concrete cutter. The original 10 h.p. engine has been replaced by a 13.5 h.p. air-cooled, 2-cylinder, 4-cycle Wisconsin Model TF. Variations in wheel speed, regardless of load and depth of cut, are stated to be virtually eliminated with this increase in power. Additional

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Rapid loading of hopper cars is easily accomplished with this Owen Bucket.

OWEN ROCK GRAPPLERS of improved, latest design are available in various types with full blade, semi-blade, or rock tines independently acting tines.

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Preferred power for self-contained refrigerating units on motor-cargo trailers — the world's most widely used single-cylinder gasoline engines.

BRIGGS & STRATTON single-cylinder, 4-cycle, air-cooled gasoline engines are the "Preferred Power" leader — on equipment, machines, tools, appliances used by the transportation, construction, oil-fields and other industries — and on farms. Briggs & Stratton Corporation, Milwaukee 1, Wisconsin, U. S. A.

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

improvements include a hose connection permitting a positive water feed to the blade from external sources. The 15-gal. galvanized steel tank remains as before for gravity feed. The improved Felker DI-MET heavy duty concrete cutter uses diamond wheels from 8 in. to 18 in. in diameter and comes equipped with blade guards of two sizes: 14 in. and 18 in. for use on the double-ended spindle. This is stated to permit cutting to a 6½ in. maximum depth without necessity of extra accessories. Felker Manufacturing Co., Torrance, Calif.

#### Excavator

A new design of Hopto digger for mounting on a Sheppard diesel tractor has been announced by Badger Machine Co. The unit has a hydraulically operated power take off. The total weight

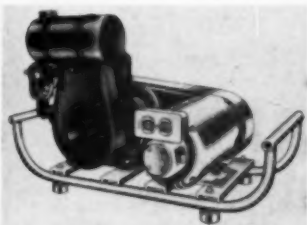


Hopto Digger Mounted on Sheppard Tractor

is 6700 lb. The swing is 180° and the reach 16 ft. The height with boom extended is 19 ft. and the digging depth is 9 ft. The lifting capacity is 2000 lb. Larger capacities can be had with stabilizers. Badger Machine Co., Winona, Minn.

#### Electric Generators

New portable gas-engine driven electric generators, Model 1800, in three general ratings, 1,000, 1,250 and 1,350 watts at 115-volts, 60-cycles, A.C., have been announced by Wincharger Corporation. The generators are equipped with sealed ball bearings for long life. It is claimed that the belted construction cushions shock to the generator, reduces vibration and increases the generator life. The generator being mounted alongside the engine locates it out of the path of the hot air from the engine cooling system, thus promoting cooler generator operation. The unit is equipped with a universal mounting base which permits mounting any one of several popular makes of engines. The generating unit may be purchased



Model 1800 Electric Generator



completely equipped with engine or may be purchased without an engine. The generator alone without the engine mounting base is also available. Winchester Corporation, 2110 East 7th St., Sioux City 2, Ia.

#### Arc Welder

A new gasoline engine driven arc welder, announced by Hobart Brothers Co., has the control panel conveniently mounted on the end of the unit as the generator end. The control panel has been moved from the side to the end of the unit to centrally locate all controls for easier adjustment of the



New Hobart Arc Welder

welding heat. On it are located the generator controls, meters, welding and ground cable terminals, polarity switch, ignition switch, starter button, oil pressure gauge, and battery ammeter, as well as the receptacle for 1 KW auxiliary power. The generator is of the symmetrical, 4-pole Multi-Range design. There are 4 laminated main poles and 4 interpoles which are removable. Patented single unit brush rigging holds the generator and exciter brushes in a fixed neutral position. Hobart Brothers Co., Hobart Square, Troy, Oo.

#### D. C. Arc Welders

The new Model GA "WASP" direct current arc welders, available in 150 and 200 ampere sizes, have been announced by Air Reduction Sales Co., A Division of Air Reduction Company, Inc. Designed to further advance the efficient performance of the Wilson line, the volt ampere characteristics of these machines are stated to make them especially suited to D.C. straight Polarity Heli-welding with Thor-Tung. Excellent commutation at all settings, plus the advantages of self-excitation and split-pole, cross-field design provide good operation at all current settings. Continuous overlap from each current range to the next provides a wide, unbroken range of welding current—30 to 250 on the 200 ampere welder and 20 to 185 on the 150 ampere machine. These light weight models provide easy portability when mounted on a two-wheeled carriage and require small floor space because of their compact construction. Air Reduction, 60 E. 42nd St., New York 17, N.Y.

#### Electric Lock Plug

A new heavy duty electric plug with a positive but simple locking device that prevents accidental disconnections has been placed on the market by Hopax



## HEAVY DUTY PORTER CUTTERS



**for cutting CONCRETE REINFORCING  
RODS and other HARD MATERIALS**

Designed and built to cut concrete reinforcing rods up to 1 1/2" diameter cleanly and quickly. Faster and more economical than a torch... and no fire hazard! Special hardened center cut round edged jaws last longer. Tools also cut up to 3/8" unthreaded bolts and 3/8" hard wire rope and stranded guy wire.

**... and the POWERPULL for added Power and Efficiency**

POWERPULL attachment for #4 Heavy Duty Cutters increases power beyond the limit of ordinary manpower by a reduction in gear box and sprocket. With this attachment the tools cut up to 1 1/2" reinforcing rods. Shown with Tripod attachment which holds tool steady for easier cutting of many pieces of rod.



See your supplier NOW and start cutting rods the easy, efficient way!

**HKP**

THERE ARE PORTER METAL CUTTERS FOR ALL THESE MATERIALS








**BOLTS   RODS   WIRE ROPE   BAR STOCK   CHAIN   NUTS**

Also manufacturers of  
**PORTER-FERGUSON** Auto Body and Fender Tools and Equipment   **PORTER PRUNERS**

Electric, Inc. This new plug, known as the Hopax lockplug, is connected in the same simple manner as any ordinary male plug. The plug fits any standard twin receptacle. A heavy metal adaptor plate with locking slots fits directly over the receptacle plate and is held tightly in place with a center screw. The plug has a sliding collar equipped with lugs to fit into two locking slots on the adaptor plate. After the plug is inserted into the wall receptacle through the adaptor plate, a slight twist of the plug collar locks the plug firmly in place until released by the operator. Hopax Electric, Inc., 547 Greenwich St., New York 13, N.Y.

#### Diesel Music Muffled

The sound of a 225 h.p. tractor engine may be music to the ears of the contractor, but sometimes he needs to turn the music down. That's why Caterpillar Tractor Co., Peoria, Ill., recently offered a complete muffler group for the new Diesel DW20 and DW21 tractors, similar to that offered for the smaller DW10. The new attachment will reduce engine exhaust noise, providing greater operator comfort and reducing annoyance for people living near job sites.

#### Connecting Links for Chain

A "universal" design in Wedglok safety connecting links for carbon and alloy chain users has been announced by the Interstate Drop Forge Co. The Universal links, like other Wedgloks, are stated to be stronger than alloy steel chain of comparable size. Only two sizes of Wedglok Universal links are needed to connect any size chain from



Wedglok Links, Disassembled (Top) and Assembled.

$\frac{1}{4}$  in. to  $\frac{3}{4}$  in., depending upon the type of chain used. Wedglok links permit users to make up chain slings safely from running lengths of chain. They can assemble slings quickly right on the job—without special equipment, to fit their exact needs. Interstate Drop Forge Co., Milwaukee, Wis.

#### Rust Preventive Paint

An improved formula of its Certified Rust Inhibitor No. 425 has been announced by United Laboratories, Inc. of Cleveland, Ohio. Outstanding features claimed for this new rust preventative paint are that it will dry in 10 minutes under normal drying conditions and one coat provides excellent hiding of the old metal surface. The new formula, known as "Rust Inhibitor No. FD-425," will withstand temperatures from minus 100° F. to plus 250° F. and is exceptionally resistant to salt air and fumes.

It may be applied over damp surfaces, interior or exterior, galvanized metal and new or rusted metal surfaces of all kinds. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, O.

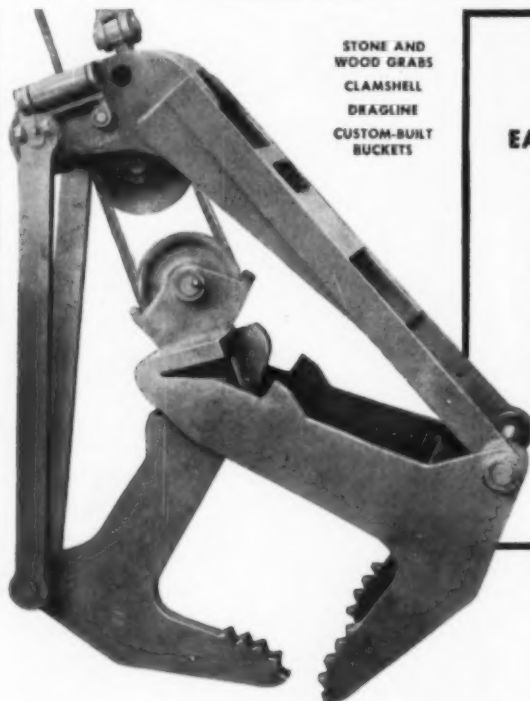
#### Steam Generator

Simplicity in design and construction is claimed for the new "Continental" packaged steam generator announced by the Boiler Engineering and Supply Co. Fully automatic and self contained it is said to be easy to install, highly efficient, and economical to maintain. One of the boiler's important features is that front and back can be opened in 15-20 minutes, providing ready access for interior cleaning and servicing. This steam generator is ready to operate when service connections are made. It is available for use with heavy oil, light oil, gas or a combination, and in sizes from 10 to 500 HP, for 15 to 200 lb. operating pressures. Boiler Engineering and Supply Co., Phoenixville, Pa.

#### Portable Gas Cutting Machine

A new portable gas cutting machine (Aireo No. 20 Radiograph) announced by Air Reduction Sales Co., a division of Air Reduction Co., Inc., is the latest addition to Aireo's line of gas cutting machines. It is specifically designed to be used as a traveling carriage for mounting such equipment as the AircomaticR machine and the Heliweld machine holder in addition to fulfilling the requirements of a portable, motor-driven, straight track-guided cutting machine. Air Reduction, 60 East 42nd St., New York 17, N.Y.

(Continued on page 95)



STONE AND  
WOOD GRABS  
CLAMHELL  
DRAGLINE  
CUSTOM-BUILT  
BUCKETS

## WELLMAN

### EASY HANDLING OF LARGE STONES

• Those big stones won't slip from the Wellman Stone Grab. Four-part closing cable reeving develops tremendous closing force on stones. Model shown has 5-ton capacity, 4½ foot jaw spread. Other capacities available.

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#### THE WELLMAN ENGINEERING COMPANY

7000 Central Avenue  
Cleveland 4, Ohio

# Bituminous

## ROADS AND STREETS



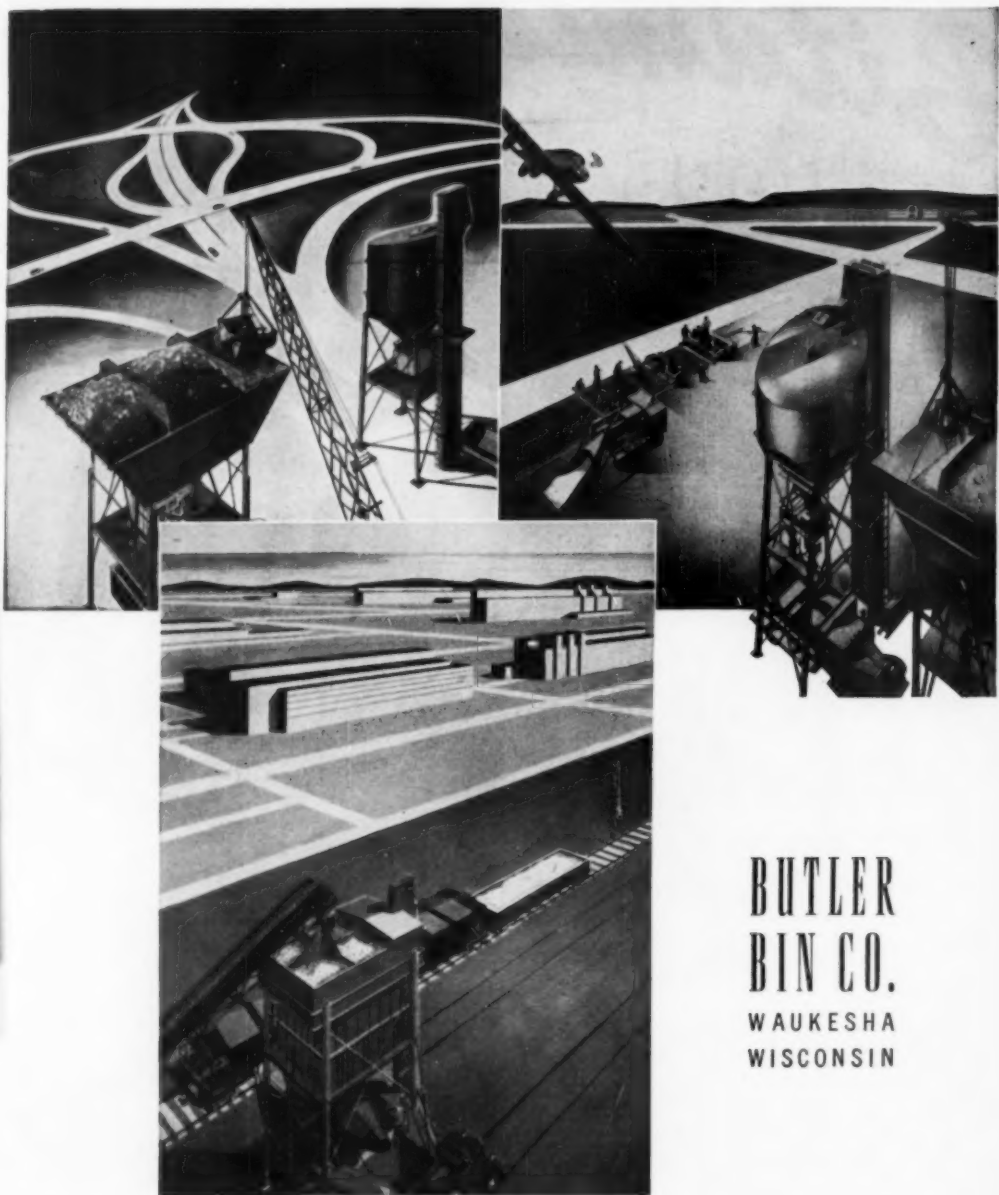
### Cover Scene

Parking apron in front of a church is being given a seal coat, as part of a program of street rehabilitation in a small Illinois town. Work performed by contractor who specializes in this type of project.

*Published by Gillette Publishing Company  
22 West Maple Street, Chicago 10, Illinois*

**Mobile Density Control Unit for Bituminous Concrete  
Fast Growing Albuquerque's \$7,000,000 Street Program  
Developments in Bituminous Road Methods  
Sand-Asphalt Filler for Plant-Mix Macadam**

**FEBRUARY, 1952**



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New production records for the world's largest construction projects are today attained through important engineering advances in automatic operation offered by BUTLER equipment.



## Short cut...to better, lower-cost roads

For a better road... a smooth, glare-free, safe road... asphalt construction or resurfacing offers real savings in time and money. It is quick-laying, low in cost. It is easy to maintain, long on service. And there's a saving through the use of local aggregate. For highways, secondary roads, and municipal streets, the short cut to a better road is through asphalt construction or resurfacing.

To make this short cut even shorter, take advantage of additional savings in

shipping time and freight costs by specifying Standard Asphalt. With five asphalt-producing refineries located throughout the Midwest, Standard makes the haul to your site a short one.

A Standard Asphalt Representative can help you take advantage of this short haul... can help you select the type of asphalt construction best suited to your needs and local conditions. For his services, write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



**STANDARD OIL COMPANY**



(Indiana)



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MODEL

543

BUCKET LOADER...



**SAVES**

man power-truck time-money

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all free-flowing materials  
at 3 yds. per minute

Cost studies prove that nothing can compete with a Bucket Loader in lowest cost loading from stock piles to trucks.

The B-G constant flow principle virtually eliminates the human element—guarantees the same hourly production all day long, whether the operator is fresh or tired out.

The new Barber-Greene Model 543 is the last word in loading economy. Backed by over a billion cubic yards handled by its predecessors, this machine is ready to cut your loading costs.

The new hydraulically controlled trimmer-conveyor combines with time-proved B-G advantages—such as the Spiral Feed, Cleanup Scraper, automatic Overload Release and Floating Boom—to save appreciable manpower on every job. With its 15 m.p.h. road speed, the 543 can get to the job fast and move from pile to pile in a hurry. It is built for high production through years of low-cost service. In addition, it is convertible to a Snow Loader for year-round usefulness.

194-A

**BARBER-GREENE COMPANY**

AURORA, ILLINOIS, U.S.A.

You're looking at  
a tough, durable road...

a **Tarmac** road!

ROADS built or resurfaced with Tarmac® are good roads—smooth to ride on, *but hard to skid on*. And because they are so tough, durable and long lasting, these roads cost less in the long run.

Tarmac makes roads that require little maintenance. They resist the stripping action of water . . . even withstand the softening effect of oil and gasoline drippings.

It's possible to speed up construction work and meet tight schedules by using Tarmac. This is why: 1) It penetrates quickly, thoroughly into roadbeds; 2) It mixes easily, speedily with *local* aggregates; 3) It adheres quickly, firmly to the aggregate; 4) It "cuts through" dust or moisture films to coat the aggregate—does it quickly.

It will be worth your while to send for our free booklet, "Surfacing with Tarmac." It shows how you can construct and maintain all types of highway and airport surfacing.

Repair Roads  
in any weather  
WITH

**Komac**® PREMIX

With this new premix, you can repair or resurface roads all year round—rain or shine, hot or cold. You can stockpile Komac Premix for over a year and it's still workable. When needed, just shovel into trucks—no heating required. Write for free booklet.

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**KOPPERS**

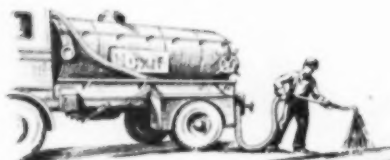
**Tarmac** MAKES BETTER ROADS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 332-T, Pittsburgh 19, Pa.

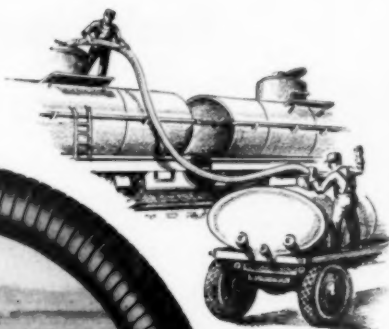
DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

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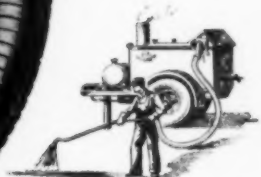
81



**TAR and ASPHALT  
TRUCKS**



**TANK CAR  
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**TAR KETTLES**

## **FLows HOT TAR FREELY ...DEFIES CONSTANT ABRASION, HEAT**

**LEAK-PROOF, HEAT-PROOF, WEAR-PROOF  
PENFLEX FLEXIBLE HOSE ASSURES SAFE TROUBLE-  
FREE TRANSMISSION OF HOT TAR**

From coast to coast, leading manufacturers and users of road surfacing equipment rely on tough, flexible PENFLEX interlocked metal hose for safe, free-flowing, trouble-free transmission of hot tar and asphalt. Tight as pipe—but flexible—rugged, leak-proof PENFLEX hose defies constant flexing, crushing, kinking, abrasion and heat . . . eliminates danger of fires.

There's a tough PENFLEX hose for every type

surfacing equipment. On tar mixers, tar and asphalt trucks, tar kettles, tank car unloaders—used both as flexible metal connections and as insulated hand hose for road spraying and patching units—PENFLEX assures top safety, efficiency, and dependability.

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# GET SET FOR 1952 NOW with a new ETNYRE "Black Topper"

Orders for new "Black-Toppers" are coming in fast for delivery in 1952. If you wish to save time, reduce labor costs, avoid money-wasting breakdowns, and handle more types of bitumin-

ous work, place your order soon to get delivery when you want it. Get information on Etnyre's new features, prices, and delivery schedule from your Etnyre Dealer or write us.



Customer-adjusted spray bar, 23 feet long, rigged for a special job where soft sand subgrade prevented driving distributor between forms.



"Black-Topper" being used for underseal work to lift pavement by pumping Bituminous Material into weakened base.



One-man controls, when desired, make it possible to operate Etnyre distributors from the cab, eliminating rear platform man, cutting labor costs.



Accurate...dependable...economical — that's what contractors, engineers and operators all over the world say about Etnyre "Black-Topper" distributors.

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SEE YOUR ETNYRE DEALER

**ETNYRE**  
**"Black-Topper"**  
BITUMINOUS DISTRIBUTORS



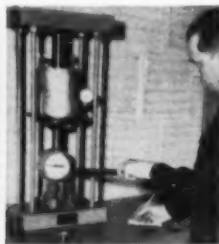
## Want assurance of better roads before you lay a foot of mix?



Let Ohio Oil's engineering staff "build" your roads in its modern laboratory . . . without cost or obligation



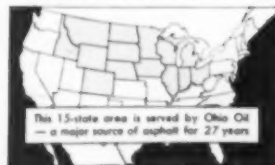
Hubbard-Fields Stability Machine finds the exact shear strength of the compacted mix.



California Bearing Ratio Stability Machine determines how well subsoil will stand up.

Wouldn't you like to be *sure . . . before* you get out on the job . . . that your local aggregate will make a *totally* satisfactory mix? That your subgrade and paving will *really* stand up to rains, freezes and thaws? That the base and wearing courses you're planning to lay above the compacted subgrade are *exactly* the right thickness?

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ASPHALT DEPARTMENT

FINDLAY, OHIO • LOVELL, WYOMING • Producers of Petroleum since 1887







★ Showing rear of density control unit. Rollers have finished this pavement area. A spot is being frozen with dry ice (beyond flagman) and core drill is being unloaded to take samples.

## Mobile Density Control Unit

### Helps Check Bituminous Concrete During Construction

**"Check as you pave," is the purpose of this successful unit, which involves freezing freshly rolled areas with dry ice for core removal**

**By H. R. Craig**

Chief Engineer, Construction Bureau

**and F. W. Kimble**

Flexible Pavements Engineer,  
Ohio Department of Highways, Columbus

SINCE 1922 the Ohio Department of Highways has been using hot-mixed, hot-laid bituminous concrete for new and reconstructed pavements. For a decade after its first use this material was used only in limited quantities. In the early 30's the utility of the material was recognized, and for each year thereafter it became more and more the means by which existing pavements were widened and resurfaced and thus kept in service.

During the war years Ohio had to look to this material as a means of keeping highways open, when the use of other materials was more restricted. As a consequence, the use of hot-mixed, hot-laid bituminous concrete received an added impetus. In 1951 Ohio placed more than 1,500,000 tons of hot-mixed, hot-laid bituminous concrete and the greater portion of this amount was used to widen and resurface existing pavements.

One of the problems that has faced

the Construction Engineer in this work is that of controlling density as pavements are being built. In past years, Ohio has attempted density control by preparing plate samples at the time pavements are being built, cutting them out after completion of

the pavement and then determining the density of the completed pavement courses. This process is time-consuming and the project is built before any information as to the density built into the pavement courses is afforded the Construction Engineer.

#### Importance of Density

When building a bituminous concrete pavement it is necessary to thoroughly densify the courses. A density approaching that such as im-



★ Operator is taking a sample along a longitudinal joint with the abrasive core drill. Dry ice in background (under sacks) is being used to freeze another area for sampling.



★ Density control unit just arrived on project. Preparation is being made to take samples

parted by traffic action is desirable. Pavements that are built during hot summer weather and subject to a period of heat and traffic do not suffer as much for a lack of density as pavements built in the Fall or early Winter that have too great a void content. Pavements built in late season are not further densified or sealed by traffic, due to the stiffness of the asphalt cement at prevailing temperatures, and they become victims of the weather. The damage to such a pavement is severe during a winter when there are periods of rainfall followed by periods of freeze and thaw. The less dense areas, such as at joints, show distress first in the form of raveling which will extend to other parts

of the pavement surface. The loose aggregate freed and left on the pavement surface will abrade other surface areas under the wheels of traffic using the pavement. The asphalt cement in such pavements will harden and weather rapidly, thereby reducing the life of the pavement.

For some years Ohio Department personnel has been engaged in developing a means of determining density as bituminous concrete pavements are being built. The most difficult problem in the process was that of devising a way to take an undisturbed pavement sample directly after the surface had been finished by rollers. As the problem was finally worked out, a sample is taken by freezing a small

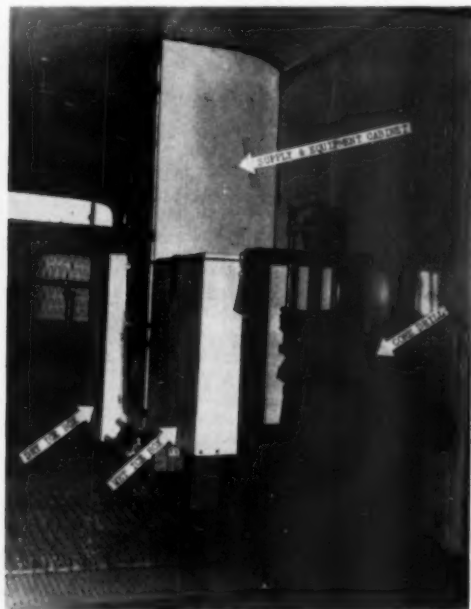
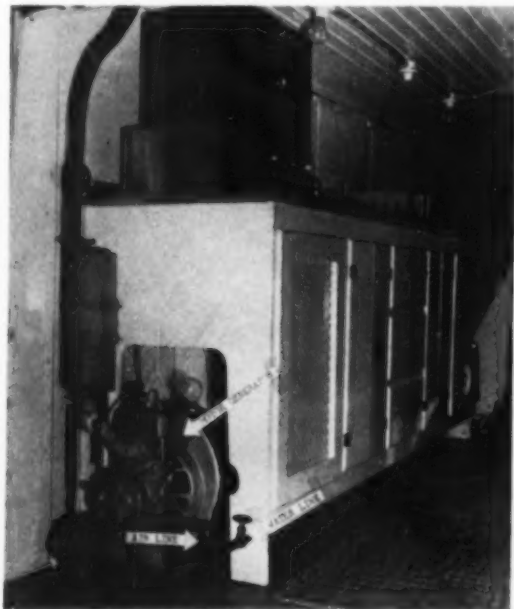


★ View of a core just removed from a pavement

area of the pavement surface with dry ice and removing a 4-in.-diameter core with an abrasive core drill.

#### Outfit Described

For the purpose of controlling density during pavement construction, a density control unit was built in the winter of 1950 and placed in service at the beginning of the 1951 construction season. The unit is essentially a special laboratory in a Vanette-type truck body with full-opening rear doors, mounted on a 1½-ton truck chassis. The inside body, exclusive of the driver's cab, is 12' 2" long, 6' 2" wide by 5' 10" high. Along the left side of the interior space looking forward, is mounted an aluminum-



★ Inside views of truck looking forward along left and right sides, respectively

covered work bench for the entire length of the truck. On the opposite side are a desk, dry ice box, cabinets, a wet ice box and a frame for carrying the core drill.

In and on the cabinet work bench are mounted a drying oven, a constant temperature bath and a small sink. Under the bench are mounted a water tank, necessary plumbing, air compressor, air tank, tank of bottled gas, and a gasoline-driven motor-generator set. The truck is electrically lighted and has several electrical outlets at necessary locations.

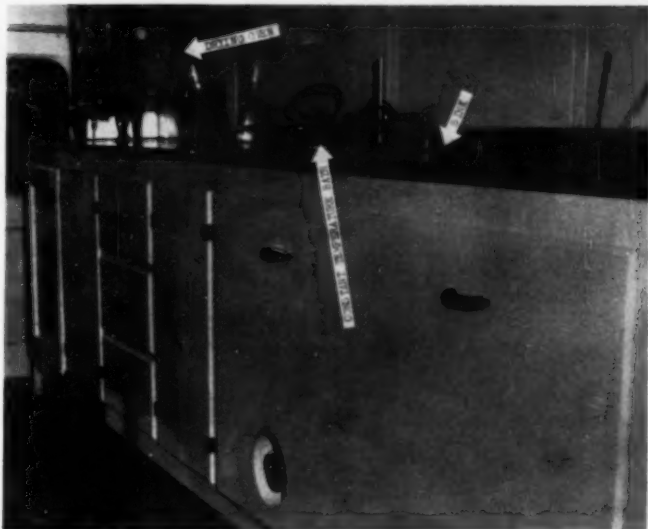
Other equipment includes a torsion balance of 2 kilograms capacity, sensitive to 1/10 gram; thermometers; drying pans; a small electric calculator; an electrical driven abrasive core drill; and incidental supplies such as forms, pencils, envelopes and stamps.

The process requires 2½ to 3 hours to complete. Immediately after the final rolling of a section of pavement, samples are taken. It is necessary to freeze a small pavement area. This is accomplished by placing a block of dry ice directly upon the surface. It requires 5 to 10 minutes to freeze a depth of 2¼ to 3 in. of freshly finished hot-mixed bituminous concrete.

The dry ice is then moved to another area to be sampled, the core drill is set over frozen area, and a 4-in. diameter core is taken. An average time of 10 minutes is required to cut a core of 2¼ to 3 in. depth. During the cutting it is necessary to use a solution of crushed ice and water to keep the area at cutting temperature.

On removal from the pavement, the core is surface dried and allowed to come to atmospheric temperature. The core is then weighed and coated with paraffin. It is necessary to keep the paraffin in a liquid state in a constant-temperature bath between 135° F. and 138° F. From experience it has been found that the paraffin must remain between these temperatures to give satisfactory coatings. After coating the cores with paraffin they are allowed to again come to atmospheric temperature, which usually requires about 30 minutes. The coatings on the cores are then examined for cracks or pin holes, and such cracks or holes repaired if necessary. The cores are weighed in air, then in water maintained at temperature of 77° F. The paraffin coating is removed and the core placed in a drying oven at 325° F. to expel contained moisture.

After dry weight of the core has been determined the volume and density are calculated. From the density so established, weight per cubic yard is determined for the compacted mix in place.



★ Inside view of truck toward rear along left side

#### How Unit Routed

With this one unit it is impossible to check every project in operation during one week at the peak of the Ohio state surfacing program. An average of 7 to 10 projects can be checked in one 5-day week. The unit is so routed each week so as to reach all projects being built of aggregates known to be difficult to densify due to particle shape and facial characteristics. At other times and when the construction season starts to slacken, all projects can be checked. By having this information at the time of construction, the Project Engineer can regulate or modify rolling procedure to secure satisfactory density in the pavement courses.

During the 1952 construction season the time required for a density determination will be materially reduced. The lengthy process of paraffin coating and weighing in water for volume determination, will be replaced with a volume-meter. With this instrument the volume of samples will be determined directly, in a small fraction of the time formerly required. By shortening the time required to complete the test, many more projects can be checked during construction.

When a project is checked, samples are taken from areas where low densities are likely to occur. These areas are along the longitudinal joints, on either side of a longitudinal joint, and near the edges of a paver spread. As a rule from 8 to 12 cores are taken on each project each time it is checked.

During the 1951 construction season this density control unit was also used

for research work. From this research, data have been gathered which establish the required roller compactive effort necessary to satisfactorily densify the various aggregate combinations used in hot-mixed bituminous concrete in Ohio. From this study and other work to be done, construction specifications will be modified to properly cover state-wide conditions. After one season of operation of the density control unit, it is felt that its cost is justified and that its use will be permanently established.

#### Manufacturers News

**General Tire Promotions.** Howard A. Bellows, of New York City, Eastern Division sales manager of The General Tire & Rubber Co., has been transferred to the company's main offices in Akron, O., to assume the duties of S. S. Poor as manager of retail merchandising. Associated with the company for 32 years, Mr. Poor is assuming new duties in General's operation. In addition to being a vice president he is also a member of the board of directors. Mr. Bellows has been with General for 26 years. Most of his service has been in eastern division sales.

**Howard W. Goodall Is Dead.** Howard W. Goodall, 78, founder and president of Dixon Valve & Coupling Co., Philadelphia, Pa., died recently. He founded the Dixon Valve & Coupling Co. in 1916 and for the past 26 years his activities were devoted entirely to the interests of that company.

**Humphrey Promoted by Timken.** George T. Humphrey, Jr., heretofore assistant branch manager of the Service Sales Division at Dallas, Tex., has been appointed assistant general manager of the Service Sales Division of Timken Roller Bearing Co., with headquarters at Canton, O.



★ Allison & Haney, contractors, placing surface course on Albuquerque street project, September, 1951. Adnun paver, Buffalo-Springfield 10-12 ton roller

## **\$7,000,000 Street Program**

### **Albuquerque's Prescription for "Growing Pains"**

**Low unit costs achieved with help of good climate and sub-grade. Three asphalt paving contractors operating on continuing schedules as new assessment districts are set up**

**A**LBUQUERQUE, largest city in New Mexico (pop. 120,000 and one of the nation's fastest growing), is carrying out a paving program said to be unequalled by any city of its size in the Southwest if not the United States.

Late in 1950, the city scheduled twenty-one paving districts averaging an estimated \$350,000 each including grading, curbs and other details. The first district was placed under contract in December, 1950, and one district has been placed under contract nearly every month since. By awarding a contract each month, the engineers have been able to maintain a well organized staff program of plans preparation and supervision, this steady flow of jobs also making it easier to make assessments and handle other incidentals encountered on assessment paving. This schedule of operations is also in keeping with the



★ Hundreds of blocks of new streets in fast-growing Albuquerque are beginning to look like this, at annual assessment costs in the "bargain" category

## Aggregate Gradation

### Surface Course

Passing	% by Weight
3/4"	100
1/2"	82-100
3/8"	68-90
#4	50-79
#10	36-67
#40	17-44
#80	9-29
#200	3-8

85-100 A.C. 5.0-7.5

### Base Course

Passing	% by Weight
1 1/2"	100
1"	70-95
3/4"	55-85
#4	30-60
#40	10-30
#200	3-10

A.C. 4.0-7.0

## Typical Job Mix

### Surface Course

Temp. A.C. 270°—Aggr. 260°—Lay Temp. 240°

Passing	% by Weight	Tolerances
3/4"	100	100
1/2"	90	85-95
3/8"	80	75-85
#4	64	59-69
#10	50	46-54
#40	30	26-34
#80	18	14-22
#200	6	4-8

A.C. 85-100 pen.; 6.2% by Total Weight

### Base Course

Temp. A.C. 260°-270° F.  
Aggr. 250° F.—Lay 235° F.

Passing	% by Weight	Tolerances
1 1/2"	100	100
1"	80	75-85
3/4"	70	65-85
#4	46	41-51
#40	22	18-26
#200	5	3-7

A.C.—either 85-100 or 100-120 pen.  
4.6 to 4.8% by total weight

Test Data (Albuquerque Testing Lab.)

Test rings taken from completed pavement after being rolled to satisfactory density.

### Surface

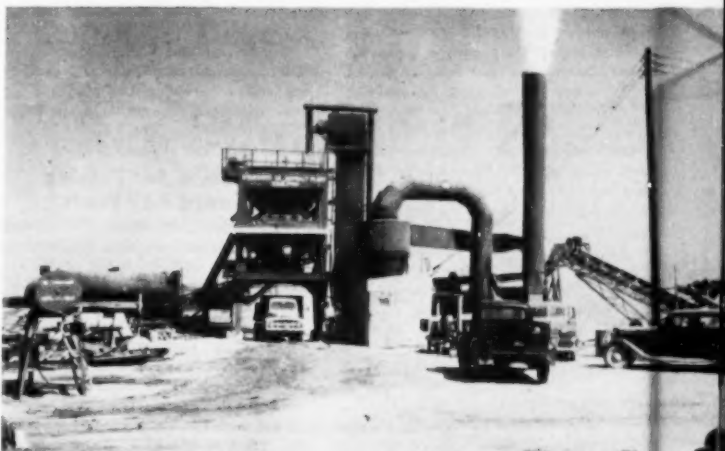
Voids in the mineral aggregate	20%
Voids filled with asphalt	79%
Bulk density after rolling	2.22
Theoretical density	2.40
% of theoretical density	92.5%
Lab. density (Marshall)	2.29
% of lab. density	96.9
Voids in compacted mat.	7.5%
Marshall flow	15
Marshall stability in lbs.	1400-1700
Weight per cu. ft.	139 lbs. compacted

### Base Course

Voids in mineral aggregate	28%
Voids filled with asphalt	60%
Bulk density after rolling	2.237
Theoretical density	2.427
% solid volume density	92.17
Voids in compacted material	7.83
Marshall flow	12
Marshall stability in pounds	1600-2200
Weight per cu. ft.	139.6

No additive (no strip) used, very little stripping has occurred. Compression immersion test (4 days in water at 120° F.) gives the following:

Unconfined compression dry	414 P.S.I.
Unconfined compression after 4 days immersion in water at 140° F.	291 P.S.I.
ratio	85.7%



★ (Above): Asphalt plant of Allison & Haney, a 5,000-lb. Standard unit located at aggregate site. (Lower): Wylie Bros. plant at Albuquerque, a 4,000-lb. Standard Steel Corp. unit.

## Typical Data on Albuquerque Paving Program

### Quantities of Hot Mix and Unit Bid Prices

District	Contractor	Total sq. yds.	Unit Price Base	Unit Price Top	Total Unit Price	Total Cnt.	Tons Course	Tons Base Course	Approx. Gallons A.C.
53-A	Allison & Haney	154,750	\$1.10	\$0.59	\$1.69	\$ 261,527	12,101	24,760	485,126
56	Allison & Haney	133,000	0.905	0.695	1.60	247,770	10,374	21,280	392,488
57-A	Wylie Bros.	144,850	1.166	0.64	1.81	262,178	11,298	26,696	427,453
59	M. M. Paul	95,000	0.87	0.71	1.58	150,000	7,410	15,200	280,348
62	Allison & Haney	128,168	0.92	0.69	1.61	206,350	9,997	20,507	378,228
63	Allison & Haney	122,400	0.95	0.75	1.70	208,080	9,547	19,584	361,203
64	Wylie Bros.	139,200	0.88	0.62	1.50	208,800	10,858	22,272	410,791
66	Wylie Bros.	209,500	0.95	0.70	1.65	345,675	16,341	35,520	618,242
Totals		1,126,868				\$1,890,480	87,928	183,819	3,326,879

capacity of the local hot mix asphaltic concrete plants.

The economy of the pavement design which utilizes local materials is proving attractive to property owners. The asphaltic concrete has averaged \$1.68 per sq. yd. for two courses totaling 4 1/2 inches thickness, this price including 7% added in the bid for engineering work. Property owners in paving districts not yet placed under contract have shown a lively

interest for their work to be started, because they want to get away from the dust nuisance which is so common to unpaved streets. In addition to the districts tabulated, ten more districts were scheduled for the first 10 months of 1952.

Subgrade and climatic conditions in Albuquerque are favorable toward an asphaltic concrete pavement of nominal thickness. Practically all of the subgrade encountered is a medium to



high bearing value sandy soil or caliche. The 4½-in. thickness of asphaltic concrete on the natural soil provides an adequate surface for the traffic. The soil subgrade is compacted and primed with a medium curing type cutback asphalt, then paved with a 3-in. binder course and a 1½-in. surface course of hot mix.

The aggregate used in the paving mixture is a processed local sand and gravel, available at the plant sites of the three contractors who have been awarded contracts to date. These contractors are Wylie Bros., Allison & Haney, and M. M. Paul & Son.

### Typical Job Data

Quantities in the accompanying tabulation for typical jobs are based on 3-in. compacted base course with exception of District 57-A. The hot mix base course in this District was 3½ in. Hot mix surface course in all the Districts was 1½ in. thick compacted.

Price per ton of asphalt concrete: (1) Surface, \$8.65 per ton which includes: Material (aggregates), asphalt, mixing, haul, laydown, rolling and clean up. (2) Base course, \$6.12 per ton. (3) Top and base combined, \$6.93 per ton, based on combined average bids.

Asphalt cement: Penetration 100-120 used in base course in all Districts except District 66, where 85-100 penetration is now used in base and surface. 85-100 penetration used in surface course on all jobs.

Work began March 15, 1951. Average output per 8-hour day reported as follows:

Allison & Haney—Standard Steel Corporation batch plant. 4-bin—5000# pug mill. 1400 tons or 175 tons an hour. (average top and base) Wylie Brothers—Standard Steel Cor-

poration batch plant. 4-bin—4000# pug mill. 1200 tons or 150 tons per hour. (average top and base)

M. M. Paul & Son—Madson 3-bin—3000# pug mill. 400 tons or 50 tons an hour.

Aggregate is obtained from local gravel deposits. Mineral filler added to the mix is imported blow sand. Allison & Haney adds filler into tunnel conveyor. Wylie Bros. adds filler before material goes into crusher. Local gravel pits are long on #10 and plus #40 material; some waste is involved in obtaining correct gradation.

Chas. E. Wells, City Manager of Albuquerque, expects that petitions for paving will continue after the present program is completed, with enough new districts created to continue at the present rate for several years.

Herkenhoff and Turney, Consulting Engineers, Albuquerque, are designing and supervising the projects for the city of Albuquerque, with T. G. Brown as engineer.

### Machine for Driving Guard Rail Posts

This homemade driver for I-beam guard rail posts was seen on Pennsylvania Route 115 southeast of Wilkes Barre. It was built by L. S. Ree & Son, Oaks Corners, N.Y., contractor on the job. It consists of a homemade steel pile hammer, operating between guides that rest on the ground over the spot where the post is to be driven, and is actuated by cable from the truck's power take-off. The boom can be readily raised or lowered.

Three men handled the work. Posts were driven rapidly and the truck moved to the next spot.



★ Contractor-built driver for guard rail post

## WITH THE MANUFACTURERS & DISTRIBUTORS

**Caterpillar Promotions.** Five promotions in the general sales department of Caterpillar Tractor Co., Peoria, Ill., have been announced by H. H. Howard, director of sales. C. E. Jones, formerly manager of the sales development division, is now parts manager in charge of planning and development work for the parts department. George P. Fenn, former assistant manager of sales development, was named manager of the division while Robert D. Evans, the division's supervisor of tractor and equipment operation, was appointed assistant manager. Changes in the central sales division concern John M. Abbey, who transfers from assistant sales manager of that division to assistant sales manager, industrial division, and N. F. Satten, presently a district representative, who will replace Abbey as the assistant sales manager of the central division.

**Thor Cincinnati Branch Moved.** Independent Pneumatic Tool Co., Aurora, Ill., has transferred its Cincinnati branch to a new, modern building at 3726-28 Floral Ave.

**Haskell Transferred to Chicago.** Thurman Haskell, sales manager in Denver since 1937 of American Steel and Wire Co., has been appointed special representative in the western area sales department, with headquarters in Chicago.

**New Warco Distributor.** W. H. Anderson Co., Detroit, Mich., has been appointed distributor for eastern Michigan of Warco motor graders of W. A. Riddell Corp., Bucyrus, O.

**To Direct Public Works Division.** W. R. Leopold, assistant to the vice president, has been appointed to direct the operations of the Public Works Division of Worthington Pump and Machinery Corporation, Harrison, N. J. D. L. Gallagher has been appointed manager of the division.

**Two Hyster Men Promoted.** Allen G. Owen, with Hyster Co., Portland, Ore. since 1937, has been moved up to the newly-created job of Western Division service manager. James Leep, with Hyster since 1946, has been advanced to the position of manager of the Parts Order Department, also a newly-created position.

**Termite Drills, Inc., Moves.** Termite Drills, Inc., Pasadena, Calif., manufacturers of Termite rotary masonry drills, has moved to new and larger quarters at 99 N. Lotus Ave., Pasadena 8, Calif.

**New Caterpillar Distributor.** Alvin Hall Machinery Co., El Paso, Tex., has been appointed Caterpillar distributor in southwest Texas and southern New Mexico. The new company will occupy the facilities formerly used by Tri-State Equipment Co. and will serve the territory formerly covered by this firm plus certain southern New Mexico counties in the El Paso-Odessa trade area. C. E. Jones, associated with Caterpillar since 1946, is general manager of Alvin Hall Machinery Co.



★ "Stop-gap" project on U. S. Route 301, south of Petersburg, Virginia. Old 20'x8" macadam widened to 24 ft.



★ Modern mixing machine applying a mixed-in-place treatment on route 460 in Buchanan County, Virginia

## What the States Are Doing to Develop

# Better Bituminous Roads

**IV—Continuing a series of state-by-state summaries highlighting developments in bituminous road design, construction and maintenance**

### Virginia

*By C. S. Mullen, Chief Engineer, Virginia Department of Highways, Richmond.*

Virginia's program of maintenance and construction is being continued on the "pay as you go" basis. Virginia has no bonded indebtedness on its 48,000 miles of roads. Hard surfacing of all roads with a traffic count of 50 vehicles or more per twenty-four hour day is our goal, and one which we hope to obtain in a few years.

The increased heavy traffic has demanded tougher bases and heavier bituminous wearing surfaces. In Virginia there is some trend toward increased use of bituminous bases where local materials are available. Also the old penetration macadam, discontinued many years ago due to its harshness, is again coming to life with a plant mix or mixed-in-place treatments used in the Maintenance Program. These treatments are of a very high quality and excellent for maintaining old out-of-shape pavements.

Bases on low cost Secondary roads are constructed of local material, crushed stone, soil-bituminous, or soil-cement, with a light bituminous wearing surface.

Due to limited funds, and growing traffic, Virginia has been forced to

construct "stop gap" improvements on some heavily traveled roads. One of the projects recently under construction was that on U.S. Route 301, south of Petersburg, where we widened the 8" x 20' waterbound macadam to 24 ft. The widening is on each side, consisting of 8-in. black base. The entire road surface will be covered with asphaltic concrete. Future construction on this section will consist of another 24 ft. parallel lane with a wide median.

Research has helped to develop better bituminous materials and higher type mixtures. All cutback bituminous materials used in Virginia must pass one of two Adhesion Tests. "Type I" materials are used in the summer months. "Type II" materials are used in the winter months, and for special treatments during the summer months on roads carrying heavy traffic.

Virginia has learned the value of trained personnel in the construction and maintenance of highways. A leading step toward the advancement in the bituminous field was in 1943 when an experienced engineer was brought in from the field to the Central Office to direct all bituminous work. Each year during the winter months all inexperienced plant mix inspectors have the opportunity to attend two weeks

of school in the Bituminous Laboratory at the Central Office in Richmond. Two other training programs that we consider very valuable are the training of superintendents, foremen, and operators in maintenance, equipment, and construction operations; and the training program for Civil Engineering graduates.

Training in the application and design of bituminous materials are well represented in all of the above programs.

### Kansas

*By W. J. Arndt, Assistant Engineer of Materials, State Highway Commission of Kansas, Topeka.*

**1. Soil-Bituminous Bases.** As a result of two projects built in 1940 and which have been under observation since that time, we have undertaken a considerable mileage bituminous soil case course construction. Actually these base courses are bituminous-sand-filler base courses.

We have not yet been successful in stabilized fine grained soils with bituminous materials without some kind of modification. The projects built have utilized fine grained sands, usually found in the vicinity, to which is added approximately 20% of a friable filler soil, most of it passing the 200 mesh. Generally these mixtures are laid at a thickness of 4 to 8 in., depending upon location, rainfall and traffic. In some cases a subbase is utilized over heavy soils.

The mixture of sand and filler soil is thoroughly blended together and provided with water, generally to a percentage of around 6% by weight. To this is added approximately 6% by weight of cutback asphalt, generally of an MC-3 grade. Mixing is performed by traveling plants, usually of Barber-Greene type and in some cases the Woods mixer. After all of the ingredients are thoroughly blended and the cutback asphalt aerated until approximately 50% of the volatiles have left the mixture, the mixture is then laid in approximately 3 in. lifts and thoroughly rolled, probably with a heavy pneumatic roller. A seal coat of RC-4 covered with chips is usually a sufficient sealing course to enable a finished pavement to be realized.

**2. Sand-Gravel Bituminous Bases.** We have utilized bituminous materials in another type of base course, employing a relatively low grade of sand-gravel to which is added approximately 10% filler soil of the minus 200 type. To this is added approximately 4½% by weight of an MC-4 cutback which when thoroughly mixed provides a base course of high strength. The wearing course in this case consists of an RC-4 seal and chips. This type of base course is used where sand-gravel is plentiful and where traffic is heavier and of greater volume than in Case No. 1 above. In reality, this sand-gravel bituminous mixture simulates a binder course and a hot asphaltic mixture. It is a lean sand-gravel mixture, placed at a thickness from 5 to 8 in.

**3. Special Project.** We had under construction during 1951 one project consisting of a sand-soil base over which is placed an asphaltic concrete base course, surfaced with a hot asphaltic surface course. This type of construction is an attempt to evolve an extremely high type road since the thickness of the asphaltic concrete base course is approximately 8 in. and the surface course is 2 in. in thickness, making a combined thickness of 10 in. The project is an access road to the Boeing Aircraft Corporation at Wichita.

All of the above types are being placed into service and Numbers 1 and 2 above have good service records over the past three years. There have been constructed approximately 75 miles of type No. 1 and 40 miles of type No. 2. The single project covered by type No. 3 is approximately 5 miles in length.

**4. Lime-Bituminous Mixtures.** We have conducted a comprehensive laboratory study of stabilized fine grained soils such as clay loams and similar materials with bituminous

materials, but first treating such soils with hydrated lime and quicklime. The action of the lime in this case reduces the plasticity of such fine grained soils to the point that aggregations are formed making the soil appear to be essentially a sandy material. The soil can then be satisfactorily waterproofed through the use of cutback asphalts similar to MC-2 and MC-3. It was our intent to construct a field project using this process during the construction season, but due to the bad climatic conditions and the necessity of using available work forces to repair flood damage, such a project has been delayed until next year.—R. D. Finney is Kansas Engineer of Materials.

### California

By Earl Withycombe, Assistant State Highway Engineer, California Division of Highways, Sacramento.

1. The California Division of Highways has recently adopted new test methods and procedures in the testing of soils and base materials in order to furnish adequate support for bituminous pavements. The new pro-

cedure rests upon the Stabilometer Test, in use for several years for bituminous paving mixtures.

2. Current field and laboratory studies are aimed at finding a means for measuring the degree of resiliency or rebound which may develop in foundation or basement soils. It is becoming evident that many cases of cracking in the pavement surfaces may be caused by undue deflection and rebound in the underlying soil. This is a different property or characteristic from that which is ordinarily described as the bearing value or supporting power of the base.

3. Investigations are also under way seeking means to evaluate the durability of asphaltic materials and to determine whether road building asphalts have adequate resistance to weathering and ageing influences.

4. Substantial success has been achieved in salvaging and restoring old bituminous surfaces. One successful method consists of scarifying an old bituminous surface by tearing up a portion of the existing untreated base and mixing the combination of gravel and oil cake with enough portland cement to form a new base.

### Another Variation in Trenching Equipment

ROADS AND STREETS in December carried an interesting pictorial account of a special heavy-duty bulldozer blade, designed for rapid cutting of widening trenches along existing pavement slabs. This effective device was built and used by the Nello L. Teer

contracting firm in N. Carolina.

Pictured here is another North Carolina widening trench digging tool. This was photographed sometime ago by Paul Miller of the North Carolina State Highway and Public Works Department. A special bucket lip made the depth and width of the desired trench is built on to the front-end bucket of a Hough loader.



★ Special trench cutting lip on the bucket of a loader, used on North Carolina widening project

A typical example would be the reconstruction of a section consisting of 3 in. of plant-mix over a 6 in. course of gravel or crusher run base. In such a case, the existing surfacing and base would be scarified to a depth of approximately 6 in. in order that the mixture would contain not more than 50% of the pulverized bituminous surface. After pulverizing, the material is shaped into windrows, cement added and mixed by blade or preferably by traveling road mixers.

No other special treatment is required as the amount of cement, moisture, mixing, spreading and compacting operations are not different than those used for the construction of cement treated bases. Compressive strengths ranging from 400 to 500 psi. at the age of seven days have been readily obtained on these blends of base material and bituminous surfacing using cement contents ranging from 4% to 6% by weight.

While tests indicate that the compressive strength will be reduced by increasing the amount of asphalt present, nevertheless, these bases have given an outstanding performance, two projects having been subjected to heavy logging trucks for more than five years. The base, as here described, is covered with a new wearing course of a bituminous mixture.

5. Another salvage method consisted of scarifying and pulverizing the old paving mixture, then applying a special solvent to soften up and reflux the old mixture. By the use of the combination of heavy scarifiers, an Athey traveling crusher and a special aromatic solvent, it was found possible to reflux and relay an asphaltic concrete pavement.\*

The rejuvenated section is in good condition and there is every reason to believe that it will give a long period of service. This operation has definite possibilities for economy, especially in outlying areas where commercial plants are not available or the cost of asphaltic materials is relatively high.

6. We have recently developed and are adopting more rigid requirements for the production of plant mixed surfacing, particularly concerning the continuous mix type of equipment. Mechanical requirements are specified to improve the uniformity of the finished product and to make sampling and inspection of the continuous plant as accurate and convenient as that provided in the batch plant. All of this is being obtained at no reduction in plant output; in fact, a reduction

\*"Softening Solvent Helps Reclaim Old Bituminous Surfaces" Roads and Streets, Dec., 1950

## THE HIGHWAY THAT WAS SHIPPED F.O.B.



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## Sand-Asphalt Filler Increases Quality of Plant-Mix Macadam

By **R. G. Hennes**

Professor of Civil Engineering

And **J. R. Clanton**

Assistant Professor of Civil Engineering  
University of Washington

Engineers have had little difficulty in designing bituminous paving mixes of adequate stability. It has been more difficult, in some cases, to provide protection against "stripping" of the asphalt film without sacrificing stability through the use of excessive amounts of asphalt. However, this hazard can be largely eliminated by use of a macadam-type aggregate with a sand-asphalt filler, which assures adequate stability by preserving the mechanical interlock of the coarse aggregate. At the same time, since the sand filler is not essential for stability, it can be impregnated with enough asphalt to provide protection against stripping.

The experimental verification of this hypothesis was concerned primarily with measuring the stability and dura-

in loss of time is accomplished.

7. Determinations of the coefficient of friction of pavement surface in both a wet and a dry condition are being carried on for the California Division of Highways by the University of California Institute of Transportation and Traffic Engineering under the supervision of Ralph A. Moyer. This survey is already resulting in revisions in surface treatments and indications are that it may lead to a change in methods of laying bituminous mixtures.

bility of test batches of various proportions. Rounded gravel was used as the coarse aggregate because it provided a more severe check, and because it is more generally available in regions having a severe climate.

Four test specimens were prepared from each sample batch. One specimen was a cylinder 4-in. diameter and 8 in. high, compacted by plunger under a steady load of 31,400 lb. for one minute. The remaining three specimens were square bars (2" x 2" x 12") compacted in two layers by a specially designed roller. The cylinders were prepared to be used in the closed system triaxial test, and the bars were prepared to be used in the freezing and thawing tests. One bar was frozen in water, one was frozen in air, and one bar was kept at room temperature.

The stability of each mixture was determined by the standard closed-system triaxial compression test. The freezing and thawing tests were conducted by freezing the bars at -16 F., with one group frozen in air and another duplicate group frozen under water, and then thawing them at room temperature (72 F.). The specimens were maintained at the -16 F. temperature overnight, and were taken out in the morning, thawed at room temperature for 2½ hr., and left to dry for another 2 hr. The dry specimens were weighed, measured, and then subjected to the sonic test.

The following statements are suggested by the results of this investigation:

1. Adequate stability can be obtained in a mix where the voids between interlocking coarse aggregate are filled with a plastic matrix of sheet asphalt.

2. Such mixes are stable over a wide range of asphalt content. This fact permits use of sufficient asphalt to provide protection against stripping.

3. Rounded gravel is a satisfactory aggregate in this type of mix.

4. A square beam makes a good test specimen because the method of compaction can closely simulate ordinary construction practice in rolling.

5. Lack of cohesion is accompanied by increased shrinkage.

*Abstract of a paper presented at the Highway Research Board's 31st Annual Meeting, Washington, D.C., January 15-18, 1952.*

## "Crane-Dozer" Speeds Unloading of Stone

Every contractor who has cursed and sworn at the slowness with which even the best clamshell crane operator unloads a gondola of stone, will be interested in a trick devised by the Seabees in Japan recently. A Seabees battalion was unloading cars of rock and gravel. The method of using a ¾-yd. clamshell bucket resulted in considerable damage to the flimsy wood car bodies and left much material around the edges and ends which had to be shoveled out by hand.

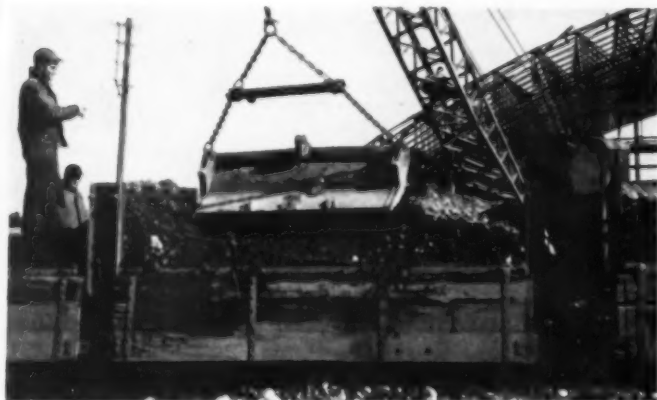
As described in the "CEC Bulletin" a faster method had to be devised to get the work done in the time allotted. The answer proved to be a bulldozer blade, modified so that it could be suspended from the crane as with a dragline bucket. Both sides of the railroad car were dropped on hinges, then the bulldozer blade was dragged across the car toward the crane, sweeping the aggregates out. Gravel and stone spilled alongside the car was picked up by earthmoving scrapers and transported to the construction site. The unloading crew with a single crane emptied as many as 50 cars a day by this means.

Later the operation was speeded up still more by developing a car tipper, working in conjunction with an under-track hopper and power conveyor belt installed alongside, which took stone directly to a crushing plant. This scheme is said to have permitted unloading of 100 cars daily.

## Manufacturers News

**Hoskins** appointed Sales Manager. George W. Hoskins has been appointed sales manager of the Large Excavator Division of Harneschfeger Corporation, Milwaukee, Wis. He replaces Paul H. Hunter, who has been transferred to P & H's San Francisco Branch.

**New Drott Distributor.** Drott Tractor Co., representing the Allis-Chalmers Manufacturing Co., Industrial Tractor Department of the Tractor Division, has opened a new sales and service branch at Rice Lake, Wis., to serve the northwest counties of Wisconsin. Herb Fenner is the manager.

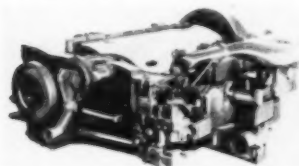




## Equipment and Material Notes

### Diesel Engine

A new horizontal 200 h.p. Model NHHD diesel engine has been announced by Cummins Engine Co. This latest addition to the Cummins line of 84 models of lightweight, highspeed diesels has been designed especially for city and intercity busses, as well as rail car applica-

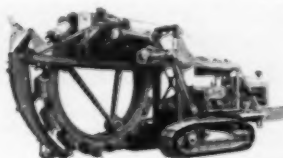


New 200 hp Model NHHD-600 Diesel Engine

tions. The NHHD-600 is a 6-cylinder, full diesel, which produces 200 h.p. at 2100 r.p.m. and with a compression ratio of 15.5 to 1. Displacement is 743 cu. in., with a bore and stroke of 5 1/4 in. x 6 in. Weight of the NHHD-600 is 2285 lb. Dimensions of the new engine are: Length, 63 15/16 in.; Width, 55 1/4 in.; and Height, 22 3/4 in. This size makes the engine adaptable for underfloor installations in busses and rail cars. Cummins Engine Co., Columbus, Ind.

### Trenching Machines

With extensive field tests completed, Parsons Co., a subsidiary of the Koehring Co., has started full scale production on two new models of Trenchliners. Both are full crawler-mounted, wheel-type machines. Model 202 is designed primarily for drainage and utility pipeline trenching. Model 215 is a special pipeline Trenchliner. With a choice of either 32 h.p. gasoline or 55 h.p. diesel engine, the Model 202 is equipped to dig in 30 separate feeds from 6.2 inches to 18.5 feet per minute; and in 9 widths from 13 to 31 in. wide and up to 6 feet deep. Other features include: friction clutch control of digging wheel, easily changed bucket-fronts with cutting lips or "Tap-In" teeth, shiftable and reversible belt conveyor for discharging spoil on either side of machine. Full crawler mounted, with either 16 or 20 in. treads, the Model 202 Trenchliner has only 5 to 6 lb. per square inch ground bearing pressure. This is particularly important on drainage, irrigation, municipal and utility-type projects for which the machine is particularly designed. For laying drainage tile, a special box and chute are

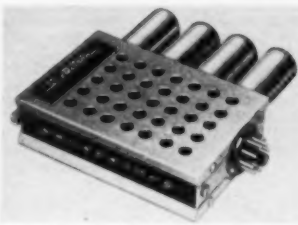


Model 202 Trenchliner

available as optional equipment. Parsons companion Model 215 has several outstanding features designed for "mile-a-day" production on cross-country pipeline installations: 6 digging wheel speeds up to 11.2 r.p.m., standard-make tractor type crawlers with lug-type shoes, 18 in. treads, and choice of two standard-make 55 h.p. diesel engines. Parsons Co., Newton, Ia.

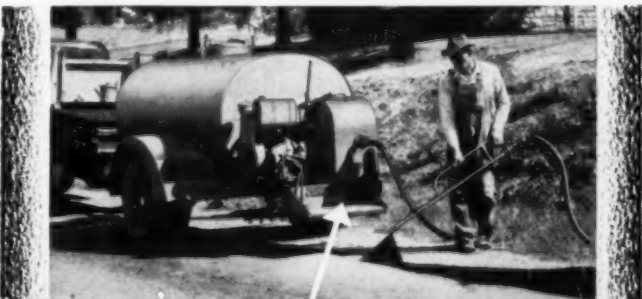
### High Rate Counting

High speed counting at near ultrasonic rates is now available to design engineers, scientists and producers with two new models of Detetron electronic totalizers procurable from Strates Instrument Co. Typical applications are in hydraulics, pneumatics, stress analysis, nuclear phys-



Detetron Electronic Totalizer

ics, aerodynamics, missile design, and in the determination of production and flow rates in the processing and fabricating industries. Designed for extreme light-



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### STANDARD STEEL "S-J" for SECONDARY CONSTRUCTION

✓ Whether used for construction of playgrounds, driveways, parking areas, or for patching, sealing, shoulder repair or crack filling, Standard Steel "S-J" works fast—economically—efficiently.

**SAVES WORK**—a special "SUCK BACK" element cleans spray bar instantly after shutting off flow of material.

**NO DELAYS STARTING**—pump and entire piping system is instantly drained after completing a job—eliminating freezing and loss of time on starting next job.

**SAFETY**—Gravity Draw off on curb side protects operator.

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### OTHER PRODUCTS

Asphalt Pressure Distributors, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms and Aggregate Spreaders.

SJ6



Standard Steel Works NORTH KANSAS CITY, MO

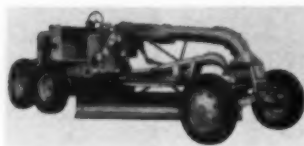
ness, portability and ruggedness, these units, weighing 10 ounces apiece, have an overall dimension of 1 1/2 in. x 5 1/2 in. Model TU-9 automatically records impulses up to 30,000 per second, while Model TU-100 will record at rates as high as 100,000 cycles per second. Stratex Instrument Co., 1861 Hillhurst Ave., Los Angeles 27, Calif.

#### Anti-Rust Paint

A new labor-saving anti-rust paint, called Rust-Cure, which can be applied right over rust without wire-brushing, scraping or sandblasting, has been announced by The Monroe Co., Inc. Available in black, aluminum and clear, Rust-Cure is suitable for both interior and exterior use on either old or new metal. Upon application, it is said to penetrate through any existing rust layer and effectively seal the surface against further rust action. The paint is compounded for brush application and may be thinned with Rust-Cure solvent for spray use. The Monroe Co., Inc., 10703 Quebec Ave., Cleveland 6, O.

#### Motor Graders

Two completely new motor graders, Models AD-40 and AD-30, have been announced by the Tractor Division of Allis-Chalmers Manufacturing Co. These newly designed machines complete a line of five motor graders having a wide range of horsepower, weight and speed. The 4 cylinder, 2-cycle, diesel powered AD-40 weighs 23,000 lbs. and develops 104 brake horsepower. The AD-30 is powered by a 3 cylinder 2-cycle diesel engine, weighs 22,700 lbs. and develops 78 brake horsepower. The graders



New Allis-Chalmers Motor Grader

have high axle clearance, the Roll-Away moldboard and accurate blade control. New standards of operating ease, incorporated into the Allis-Chalmers AD motor graders, include easier shifting, complete visibility, feather touch hydraulically-operated steering and all around operator comfort. Accessibility to major assemblies, for service or repair, is an important feature in the new AD motor graders. Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

#### Van for Hauling Explosives

As a result of World War II experience with the hazards of hauling explosives, a special van has been developed for the purpose by the Fruehauf Trailer Co. Some of the safety provisions



Special Van for Hauling Explosives

in these vans include body interiors in which all surfaces are of non-sparking metals. The walls and doors are lined with laminated wood fastened with brass screws. Brass bolts are used to fasten the sturdy oak floor to the steel sub-floor. Unloading is made easier by having maximum opening, full-width rear doors and optional side doors which swing back parallel to the trailer sides. All outside panels are completely weather-lapped and watersheds above doors prevent leakage. Wiring is protected by conduit and weatherproof junction boxes and connections. A valuable feature is the fully automatic coupling which keeps the truck operator away from the explosive cargo. The coupling is completely cab-controlled. Fruehauf Trailer Co., Detroit 32, Mich.

#### Trailer

A new heavy-duty gooseneck-type trailer with tilting platform for transporting heavy machinery with standard fifth wheel tractors, has been announced by La Crosse Trailer Corporation. The trailer is stated to be easily loaded or unloaded in 5 minutes by one man, without skids or blocking. Available in 14, 18 and 22 tons capacity, the new Model GTTA trailer is of tandem axle design, with 96 in. width platform, which tilts into loading position by releasing simple lock at front of platform. Two double-acting hydraulic cylinders "cushion" load during tilting. After load is driven or winched into place, platform locks automatically in horizontal position for hauling. Trailer is ruggedly constructed with one-piece formed gooseneck and subframe, and is equipped with "walking beams" supporting the axles, to provide

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- ADJUSTABLE
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- EITHER DIRECTION
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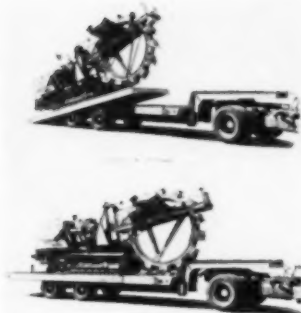
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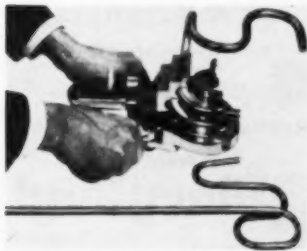


New Trailer in Tilted and Loaded Position

maximum oscillation for equal load distribution over any type road surface. Constant rise S cam brakes operated by worm gear slack adjusters assure perfect braking contact at all times. Trailer carries eight 15 in. tires with extra wide base rims, and is available with either air or vacuum brakes. Three lash hooks on each side are included as standard equipment, with the usual lights, reflectors, stake pockets and other accessories available at extra cost. La Crosse Trailer Corporation, La Crosse, Wis.

#### Tube Bending Tool

A new item added to the line of Tal Bender, Inc., is a little tool for making offsets and bends up to 180° in 3/8 in., 1/2 in. and 3/4 in. O.D. K and L copper tubing, brass, Bundy weld, steel and



Hand Tool for Bending Tubing

other light gage tubing. Made from a special strong light weight metal, this little hand tool is fast and simple to operate, and no vise or fixtures are required. As all three sizes are combined in one and the same tool, it is called the "3 in ONE" (model No. 1200). It has no loose parts. Its weight is 5 lbs. Tal Bender, Inc., Milwaukee 2, Wis.

#### 2 1/2 Ton Diesel Truck

A new three cylinder diesel truck has been announced by GMC Truck and Coach Division. This new GMC D450-37 is a 2 1/2 ton unit with five available wheelbases for either truck or highway models. The truck has a maximum geared speed of 54.4 miles per hour and a total gear reduction of 46.9. The engine under the hood of the D450-37 is the GM 3-71, smaller brother of the well-proved 4-71 and 6-71 diesels used in GMC 650 through 980 model series tractors. Like the larger "71" series engines, the 3-71 employs the exclusively GM 2-cycle design, direct fuel injection and fuel



New GMC 2 1/2 Ton Diesel Truck

modulator. New feature is an electrically-operated shift control for the models with two-speed axles. The axle shift

control button is conveniently mounted on the transmission gearshift lever, giving the driver a quick, positive control independent of vacuum or air supply systems. Another innovation is an air-actuated hydraulic brake system, which combines air actuation with the advantages of dual-cylinder hydraulic brakes at front and rear. The new system provides the driver with air-braking power combined with the brake "feel" of a pedal-controlled hydraulic system, and fast, positive brake actuation. Physical brake application still is possible before air pressure builds up. GMC Truck and Coach Division, 660 South Boulevard East, Pontiac 11, Mich.

#### Rear-Wheel-Drive Mower

A new rear-wheel-drive fairway motor has been added to the line of gang

## Moto-Paver

### Cuts Resurfacing Time-and Costs



#### Makes old roads and streets look—and ride—like new!

Moto-Paver does the complete mixing and laying job on resurfacing work—in one continuous operation. Speeds the job—cuts the cost. Produces a smooth, waveless surface even on rough, irregular pavement. Makes old roads and streets look—and ride—like new. Gives a uniform mix using beach sand, gravel, crushed stone or slag aggregates, and various bituminous materials including tars, cut-back asphalts, road oils or emulsions. Road speeds up to 25 mph. make possible quick moves from job to job.

Standard and heavy duty models for all types of resurfacing, retread and stabilization jobs under all kinds of operating conditions. See your local H & B distributor or write for Bulletin MP 49.



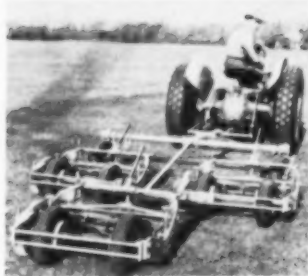
HETHERINGTON & BERNER INC.

Engineers • Manufacturers

721 Kentucky Avenue

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## BITUMINOUS ROADS AND STREETS



New Roseman Mower

mowing equipment of Roseman Mower Corporation. According to the manufacturer, the rear wheel design was perfected to meet the demand of certain users who prefer the wheel type of mowing equipment and yet are desirous of obtaining the advantages of a rear drive mower. Among the several features set forth by the manufacturer is the engineering design of the rear-wheel-drive which permits the mower to hug the ground while mowing. This feature assures controlled uniformity of cut without raising, lifting or bobbing of the rear of the mower unit. The ability of the rear-wheel-drive to eliminate side slip on steep hills and bunkers is another distinct advantage. The new Roseman mower has as standard equipment a Hi-cut hitch for mowing high grass and the new "E-Zjust" hand reel adjustment which permits quick and easy ad-

justment of the bed knife without the use of hand tools. The new Roseman rear-wheel-drive mower is offered on either steel or rubber wheels, in 3, 5, or 7 gangs. Roseman Mower Corporation, Evanston, Ill.

### Emergency Light

A automatic emergency light, announced by General Scientific Co., furnishes light when regular power fails. Plugs into any socket 110 volt A.C. out-



GS No. 16 Emergency Light

let (D.C. available). If there should be any interruption in the regular lighting circuit the GS No. 16 light will come on instantly and automatically, from power supplied by a dry battery. The light clamps on to a standard 6 or 7 1/2 volt dry battery. The 21 c.p. floodlight will give many hours of emergency light. The light is adjustable in any direction. Unit is self-contained, portable, can be carried for rescue or emergency work. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

### Nut Lock

A new capnut, to be known as the Security Caploc, announced by Security Locknut Corp., provides the positive locking of the Security locknut wherever acorn or capnuts must be used. It affords a protection against moisture and corrosive action that destroy bolt ends and make a nut non-removable. It also provides protection for the bolt itself where mutilation and abrasion are possible. The Security caploc is designed internally with features identical to the Security locknut. This consists of a high-quality, heat-treated alloy spring steel insert within the cap. This insert acts purely as a locking device. The load is borne entirely by the Caploc nut body. The insert is elliptical in shape but is forced back into the round by the bolt as it passes through. The locking power develops by the pressure exerted on the bolt by the narrow sides of the ellipse. The ear on the insert, assembled into a pre-drilled hole, prevents the nut itself from turning in service. Security Locknut Corp., Melrose Park, Ill.



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is to want it*

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The first of the Texas-New Mexico installations of the new STANDARD SM SERIES ASPHALT PLANT was in February, 1951, at Albuquerque, New Mexico. News travels fast in the great Southwest. Operators from the surrounding territory came, saw, and were convinced. In less than 6 months eight more STANDARD PLANTS had been purchased in the same area.

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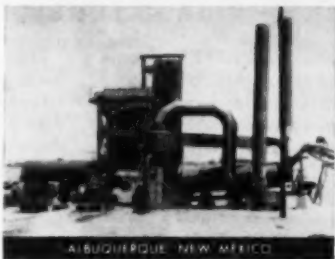
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Oakland 1, Calif. Portland 7, Ore. Seattle, Wash. Washington 6, D. C. San Juan 23, P. R.  
*Manufacturers of Asphalt and Asphaltic Products*

## MANUFACTURERS' LITERATURE

### Air-Entrained Concrete

A new and enlarged edition of the Protex modern placement of concrete fact book has been published by Autolene Lubricants Co. The new edition contains the latest technical information and field use tips on air-entrained concrete. Complete with photographs of latest concrete construction projects, the book is full of question and answer information about air-entrainment technique and Protex air-entraining solutions. Autolene Lubricants Co., Industrial & Research Division, Denver 9, Colo.

### Protective Coatings

Gaco neoprene protective coatings are described and their applications listed in a 4-page circular. A recommendation chart for the selection and application of the various products for providing protection against corrosion and abrasion is included. Gates Engineering Co., P.O. Box 1711, Wilmington, Del.

### Vibrating Equipment

A new 4-page circular on Viber concrete vibrating equipment shows various model changes. Included are descriptions, illustrations and specifications for pneumatic external vibrators, and three models of internal vibrators—Model E electric vibrator, Model P pneumatic vibrator and Model G gasoline vibrator. Five models of special purpose vibrators, new additions to the Viber line, are illustrated and described. The Viber full depth internal concrete paving vibrator also is covered in the circular. This unit has a battery of correctly spaced vibrators, designed to fit concrete spreaders or finishers of 11 and 25 ft. widths. Viber Co., 726 South Flower St., Burbank, Calif.

### Clay Products

A new catalog has been issued by Universal Sewer Pipe Corp. Its features include both plus and minus discount schedules, recent products such as Tylox rubber couplings, ventilator caps and terrace tile. It also contains useful information on carrying capacities, etc. Universal Sewer Pipe Corporation, 1500 Union Commerce Building, Cleveland 14, O.

### Determination of Azimuth

An almanac supplement, listing 28 selected stars for determination of azimuth by stellar observation, is an innovation of the 1952 edition of the Gurley Ephemeris, published by W. & L. E. Gurley, 107-year-old manufacturer of engineering and surveying instruments. The supplement to the 84-page pocket-size Ephemeris is an abridgement of the American Nautical Almanac, and gives complete instruction for determining azimuths by methods similar to those used in observation of the sun and Polaris. W. & L. E. Gurley, Troy, N.Y.

### Locating Underground Pipe

The "How" of electronic pipe locating equipment is described in a 16-page re-

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### WILLARD CONCRETE MACHINERY

SAVE SET UP TIME and take down time . . . eliminate long hauls . . . and batch-mix at the job with completely mobile Willard Machinery.

WEIGH BATCH LOADER picks up aggregates from stockpiles and weighs to specification.

PORTABLE LOADING CONVEYOR delivers batched aggregate and cement to transit mixers.

TRANSIT MIXERS available in any capacity up to 5 cubic yards.

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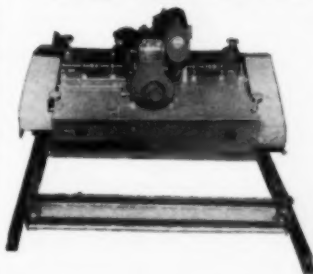
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*Faster, Easier* with DOTMAR CURB and GUTTER PAVER!



Only 5 to 10 Minutes  
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--UP to 72in. Wide



Contractors, Municipalities, testify DOTMAR pays for itself in first mile of curb and gutter paved; proportionately in paving walks, highway widening strips and highway dividing curbs. No face forms to set in curb work. Hundreds in use. Send for Dotmar Paver Bulletin 52.

## Dotmar INDUSTRIES Inc.

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KALAMAZOO, MICH.

print available from The Goldak Co. Various features of the equipment are pictured and explained. Sections of the paper cover methods of using the equipment to trace out the direction of a pipe, accurately pinpoint its location, measure its depth and locate a dead end. Uses of this instrument in tracing out a clay or tile line, locating cables and conduits and detecting valves, curb boxes, meter boxes and manhole covers are also described. The paper is a very complete and useful discussion of the methods of locating underground utilities. The Goldak Co., 1544 West Glenoaks Blvd., Glendale 1, Calif.

### Steel Bridge Flooring

A comprehensive folder on its new IQ-35 steel bridge flooring is available from Kerlow Steel Flooring Co. This latest Kerlow development, whether laid longitudinally or transversely on a bridge, will carry H20 loading on a 15 in. circle up to a span of 48 in. and weighs approximately 19 lbs. per square foot of grating. Kerlow Steel Bridge Flooring Co., 222 Culver Ave., Jersey City 5, N.J.

### Wood Preservation

A completely revised American Wood-Preservers' Association Manual of recommended practice has been issued. It contains all of the current standards of the Association relating to preservatives, treatment of commodities, and analysis methods used in the impregnation of wood for protection against fungi, insects, marine borers and other destructive agencies. It also contains miscellaneous standards for the purchase and preservation of forest products, inspection and care of treated wood, as well as conversion factors and correction tables. American Wood Preservers Association, 839 Seventeenth St., N.W., Washington 6, D.C.

### Ice Removal with Seaman Mixer

A new use for the Seaman pulvi-mixer is described in a recent circular. Illustrations show the mixer engaged in ice and snow removal operations. The mixer is being used to break up sheet ice on highways and streets and in pulverizing hard packed snow at the curbs. No special tines are required on the mixer for ice-removal operations. Rotor provides a cutting width of 7 ft. The mixer has selective speed transmission for choice of forward travel best suited to ice and snow conditions. Seaman Motors, Inc., 305 N. 25th St., Milwaukee 3, Wis.

### Whiteprinting Outfits

An informative new bulletin (No. 265) on low-cost Spee-Dee whiteprinting outfits, issued by Peck & Harvey, illustrates and describes the outfits and also gives helpful facts about the whiteprinting process and important suggestions about printing and developing. Peck & Harvey, 5736 N. Western Ave., Chicago 45, Ill.

### Power Drive

The new Tangen top-mounted power drive is illustrated and described in a 4-page circular. No supplementary power plant is necessary with this newly engineered power drive. It is designed to place full reliance on the vehicle engine as a source of power whether the vehicle is in motion or stationary. The power drive becomes an integral part of the transmission. The gear mechanism, utilizing ball and roller bearings



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throughout, is stated to be capable of delivering 92 per cent of the engine power. Mobile Power Inc., 3020 E. Grand Blvd., Detroit 2, Mich.

### Safe Practices in Changing Tires

Containing 10 fundamental safe practices which it recommends be used in changing tires, particularly those for trucks and other commercial vehicles, an illustrated 11 in. by 17 in. poster has been published by The B. F. Goodrich Co., Akron, O. Illustrations, in cartoon style, graphically portray each of the 10 safety practices. Basic appeal of the poster is to respect the terrific force represented by the confined air in an inflated tire.

### Heat Machines

A 6-page bulletin describing the new line of Fageol heat machines, explains the machines' principle of spraying heated air out at floor level to form a blanket of warm air in the working area. Among the applications of this portable, oil burning machine, are heating construction machinery and concrete. Fageol Heat Machine Co., 5725 Mt. Elliott Ave., Detroit 11, Mich.

### Plywood

A new 43-page "Weldwood Catalog" has been published by United States Plywood Corporation. The booklet contains descriptions, photographs, specifications, and list prices of softwood and hardwood plywood, doors, plastics and the many specialties which comprise the Weldwood family of products. United States Plywood Corporation, Weldwood Building, 55 West 44th St., New York 18, N.Y.

### Discharge Valve for High Head

New 16-page color-illustrated bulletin No. 156 features the Howell-Bunger free discharge valve for high and low heads. The chief advantage claimed for the valve is the prevention of "hot holes" in the bed of a stream since the water is discharged in the form of a fine spray. Other advantages are explained in detail. Bulletin contains a cutaway view, numerous illustrations of the valve in action, detailed specifications and shop views. S. Morgan Smith Co., York, Pa.

### Crane

Various features of the Little Giant Crane are shown in a 6-page circular. This machine can be truck mounted, crawler mounted, or rail propulsion mounted. It can be equipped as a crane.

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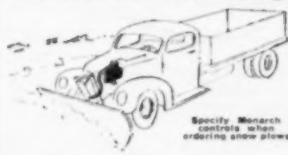
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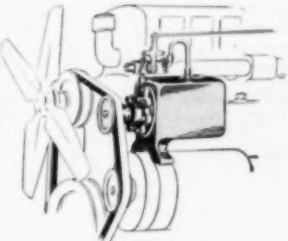
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dragline, clamshell, shovel, trench hoe, electric magnet or pile driver. It has patented heavy duty clutches and a patented ball bearing turn table. Specifications are given in this circular. Little Giant Crane & Shovel, Inc., East 16th and Howard Drive, Des Moines 13, Ia.

#### Wideners, Pavers, Spreaders

The APSCO line of wideners, base pavers, bituminous paver finishers, widening chippers and tandem rollers are illustrated and described in a 4-page circular. General specifications for each machine are included. All Purpose Spreader Co., Elyria, O.

#### Hopper Car Unloader

The latest Lippmann material handling development, a hopper car unloader, is featured in Bulletin No. 1530. The loader is of the belt type and has no chains. It is stated to have a rated capacity up to 300 tons of coal per hour. On sand or gravel the rated tonnages are stated to be higher. Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis.

#### Accident Prevention in Construction

The American Standard Manual of Accident Prevention in Construction, A10-1-1951, has been approved by the American Standards Association. The standard presents, by illustrations, specifications and simplified text, the safe way of performing construction work and emphasizes the costly results of incorrect, unsafe practices. The Associated General Contractors of America developed the first edition of this

manual 25 years ago, and they have revised it periodically to make sure that it reflects the latest industrial practices. All editions since 1935 have been submitted to ASA for approval as an American Standard. Copies can be obtained from American Standards Association, 70 East 45 St., New York 17, N.Y., and the Associated General Contractors of America, 1227 Munsey Bldg., Washington, D.C.

#### Chain Connecting Links

A bulletin (851UW) announcing Universal-type Wedglok safety connecting links for chain or wire rope assemblies is available. Only two links are needed to serve  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. chain. Other sizes up to 3 in. Stated to be stronger than published strength of comparable alloy chain. Permits permanent assemblies or repairs in the field. Interstate Drop Forge Co., Products Division, 4001 N. 27th St., Milwaukee 9, Wis.

#### Conveyor and Elevator Belting

A new catalog on conveyor and elevator belting published by New York Belting and Packing Co., gives all the necessary data to layout a drive or specify a belt. Complete tables on carrying capacities, horsepower factors, pulley diameters, maximum and minimum plies for proper troughing and other engineering information are included. New York Belting and Packing Co., 1 Market St., Passaic, N.J.

#### Technical Data Catalog

Its 1952 catalog of pocket size dollar technical data books has been announced by Lefax. Over 2000 subjects are listed

covering every branch of engineering. Each handy, loose leaf book contains approximately 140 pages of reference material that can be carried in the pocket for convenient reference right on the job. Lefax, Philadelphia 7, Pa.

#### V-Belts

New improved Manhattan single groove V-belts are described in a new bulletin issued by Raybestos-Manhattan, Inc. According to the manufacturer, Manhattan FHP belts embody an advanced design with straight sidewalls for more grip and with cords in the strength member held in a straight "power line" by a special "truss ply" of finely woven duck under the top cover. New standardized belt numbers and a list of standard sizes of belts are included in the bulletin. Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N.J.

#### Some Equipment To Be Scarce

(Continued from page 43)

ing, Mich.; G. W. Gage (see above); H. R. Lunn, Boardman Co., Oklahoma City, Okla.; Beal Shaw, Shaw Sales and Service Co., San Francisco; W. R. Parnell, Construction Machinery Corp., Shreveport, La.; and J. G. G. Morgan (see above).

P. D. Hermann and J. R. Randle continue respectively as executive secretary and field secretary of AED.

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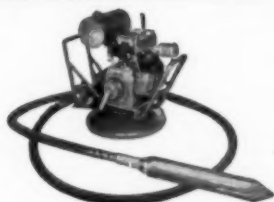


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Diesel—1946
- 1—61W Byers Traveler—Buda Gas—  
1947
- 1—407 General 1 Yd. Dragline and  
Shovel Combination—Cummins  
Diesel
- 1—LS40 Speeder Shovel and Backhoe  
—Gas
- 2—307 General 3/4 yd. Shovels—Buda  
Diesel
- 2—201 Galion Graders—International  
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- 1—Austin Western 10 Ton Roller—  
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- 1—Huber 10 Ton Roller—Gas
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7 Woodridge BBS, 9-yd  
3 Woodridge BBU, 12-yd  
2 LaPlant Chateaux C84, 12-yd  
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15'x20'	26.01	28.69	32.34	36.82
18'x24'	31.30	34.33	41.84	49.51
18'x24'	37.47	41.89	47.08	55.81
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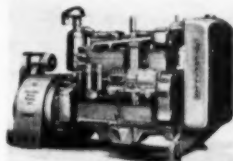
BUCYRUS-ERIE model 120-B dragline  
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1 1/4" to 2 1/4", 4 point 1" socket,  
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These Chains will fit many other Size Tires.

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TWIN DUAL MASTER equipped as follows: Including bin, 1024 Jaw Crusher, 18" x 24" Twin Dual Roll Crusher, R85G, 4" x 12", 3 1/2" Deck Screen, D-1000 F Caterpillar Diesel, hydraulic hoist truck, sand conveyor, Feed conveyor 30" x 32", Delivery conveyor 24" x 44". UNIVERSAL RBSL 28" x 36", PRIMARY JAW CRUSHER PORTABLE mounted on trailer-gas power. Absolutely in top condition \$42,500.00.

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These DW-10's are equipped with bottom dump wagons, serial numbers 2IN-2811, 1N-2812, 1V-87 Wagon serial numbers 2R-5235, 3R-5236 and 3R-5332. These units are the earlier model but have been maintained perfectly and since they have been used only in dirt the bodies and tires are in perfect condition. The 1N series are priced at \$7,500 and the 1V-87 at \$9,500. These are ready to go.

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Three 2U Series, One 8R series, 3 1H Series, all with Caterpillar 225 Power Control Units. These tractors are considerably above average as they have had excellent maintenance and were used as pushers and with scrapers on a good dirt job with no rock. The 1H series have been completely reconditioned and are priced at \$9,950, the 8R at \$11,500 and the 2U's at \$12,950 each.

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This shovel was worked on only one shale-rock job for about eight months and was then brought in to yard for storage and has been completely reconditioned to perfect shape. It is equipped with Caterpillar D-17000 engine, independent boom hoist, 2 1/2 yard bucket, 5/N 3627. Price on cars \$40,500.

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We have an almost new D-8 to offer, 400 hours, 1/2 2U/3M equipped with Caterpillar 80 Scraper which is in very good mechanical condition with the rubber about 60%. These are offered at \$31,500.00 for both units. In excellent condition.

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Four model 38FD's with 87W wagons, 3 29FD's with 58W wagons and 3 34FD's with 58W wagons. All of these units are in exceptional condition throughout and the model 38FD's are in 95% of new condition. Priced, ready to go at \$16,500 on the 38FD's and \$12,500 on the 29's and 34's. Used in dirt only—no rock. Also 6 older Euc's w/Cummins Diesel engines, good opr. cond., rubber fair, each \$3500.

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1—Allis Chalmers 25N gyratory crusher  
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This machine is less than two months old  
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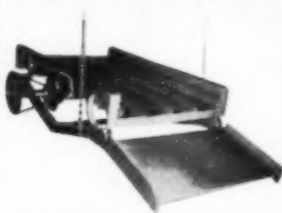
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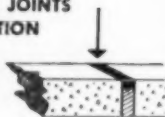
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*Hazard*

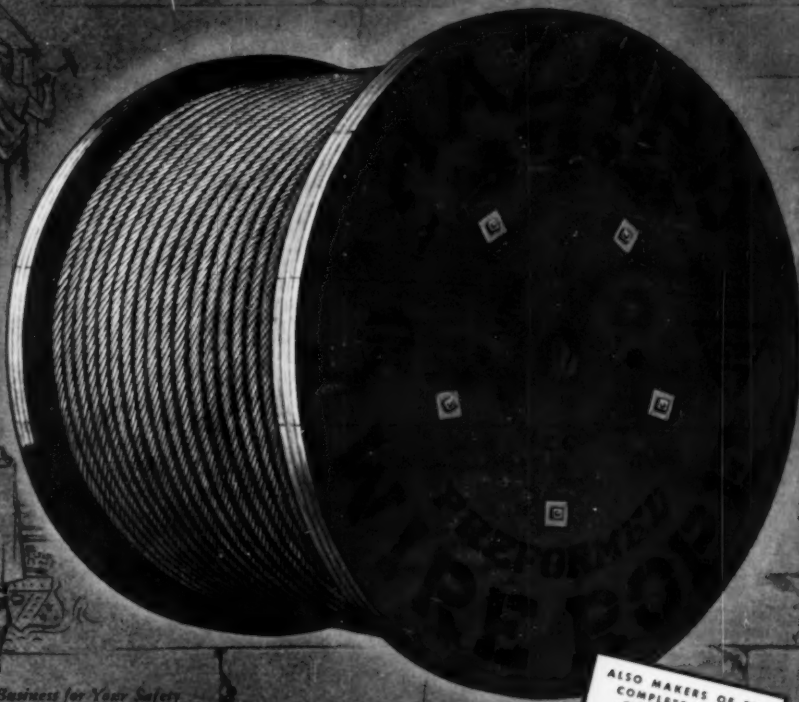
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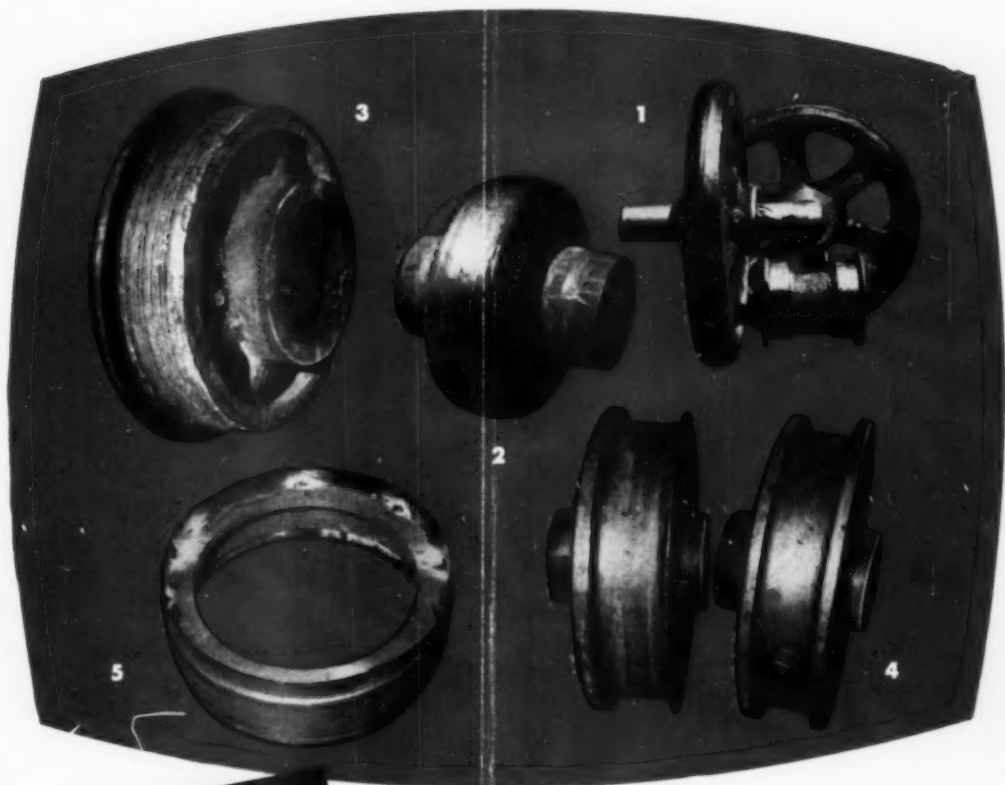
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1. **SHOVEL IDLERS**  
Bolted up and hard-faced automatically with Stooddy 105, this shovel idler and tractor roller are exceptionally smooth and long wearing.
2. **SHOVEL ROLLS**  
Note the even deposit on this shovel roll. Stooddy 105 will at least double its useful life—save hours of downtime.
3. **MINE CAR WHEELS**  
Mine car wheels sustain heavy wear from track debris. Stooddy 105 retains size and roundness—keeps wheels on the job under difficult conditions.
4. **CRANE WHEELS**  
Here, unprotected and hard-faced crane wheels are compared. Note wear evident on wheels of unprotected wheel, left. Stooddy 105 has held size on wheel at right.
5. **BRAKE DRUMS**  
Surface of this brake drum is automatically hard-faced with Stooddy 105 and subsequently machined. Resulting smooth surface far outwears unprotected drum.

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